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EDISON ELECTRIC INSTITUTE BULLETIN

AUGUST, 1938

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EDISON ELECTRIC INSTITUTE

STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

Compiled Monthly by the Edison Electric Institute—Covers 100% of the Industry

DURING THE MONTH OF MAY

	1938	1937	%
	SOURCE OF ENERGY		
Kilowatthours Generated (Net)			
By Fuel Burning Plants	5,024,370,000	5,385,449,000	− 6.7
By Water Power	3,574,315,000	4,124,496,000	−13.3
Total Generation	8,598,685,000	9,509,945,000	− 9.6
Net Purchases			
From Other Sources	283,957,000	270,317,000	+ 5.0
Net International Imports	97,229,000	107,743,000	− 9.8
Total Purchased Power (Net)	381,186,000	378,060,000	+ 0.8
Total Input	**8,979,871,000**	**9,888,005,000**	**− 9.2**
	DISPOSAL OF ENERGY		
Total Sales	**7,231,257,000**	**8,121,885,000**	(a)
Energy Not Reported as Sold			
Used in Electric Railway Department	30,255,000	48,267,000	(a)
Used in Electric and Other Departments	146,927,000	140,577,000	(a)
Furnished Free or Exchanged in Kind	2,275,000	(Not Shown)	(a)
Total Not Reported as Sold	179,457,000	188,844,000	(a)
Total Energy Accounted For	**7,410,714,000**	**8,310,729,000**	**−10.8**
Losses and Energy Unaccounted For	1,569,157,000	1,577,276,000	− 0.5
Total Output (To check above **"Input"**)	8,979,871,000	9,888,005,000	− 9.2

CLASSIFICATION OF KILOWATTHOUR SALES

Based on FPC Classification—May 1938		**Based on EEI Classification—May 1937**	
Residential or Domestic	1,464,813,000	Domestic	1,327,133,000
Rural	(Allocated to Other Classes)	Commercial—Small Light and Power	1,368,155,000
Commercial and Industrial	4,971,854,000	Commercial—Large Light and Power	4,728,638,000
Public Street and Highway Lighting	136,349,000	Municipal Street Lighting	163,732,000
Other Public Authorities	189,112,000	Street and Interurban Railways	350,752,000
Sales to Railroads and Railways	427,866,000	Electric Steam Railroads	103,393,000
Interdepartmental	34,563,000	Municipal and Miscellaneous	80,082,000
Other Sales	6,700,000		
Total Sales	7,231,257,000	Sales to Ultimate Customers	8,121,885,000

CLASSIFICATION OF CUSTOMERS

Based on FPC Classification—May 31, 1938		**Based on EEI Classification—May 31, 1937**	
Residential or Domestic	22,759,165	Domestic	22,007,802
Rural	(Allocated to Other Classes)	Commercial—Small Light and Power	3,847,204
Commercial and Industrial	4,546,791	Commercial—Large Light and Power	554,600
Public Street and Highway Lighting	26,059	Municipal Street Lighting	34,378
Other Public Authorities	74,404	Street and Interurban Railways	322
Railroads and Railways	284	Electric Steam Railroads	26
Interdepartmental	305	Municipal and Miscellaneous	36,413
Others	3,541		
Total Customers	27,410,549	Total Ultimate Customers	26,480,745

REVENUE (b)

Based on FPC Classification—May 1938		**Based on EEI Classification—May 1937**	
Revenue from Sales Excluding Sales to Other Public Utilities	$168,996,200	Revenue from Ultimate Customers	$173,482,300
Other Revenue	1,986,900		
Total Revenue	$170,983,100		

ESTIMATED DOMESTIC ELECTRIC SERVICE RATIOS

(For the 12 Months Ended May 31st)

	1938	1937	%
Kilowatthours per Customer	825	761	+ 8.4
Average Annual Bill	$35.63	$34.55	+ 3.1
Revenue per Kwhr	4.32¢	4.54¢	− 4.8

(a) Data for two years not strictly comparable.
(b) Data not comparable because of an unascertainable amount of "Revenue" in May 1938 which may or may not have been included in the 1937 data.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 6 AUGUST, 1938 No. 8

Some Principles for Making Standards

By Alexander Maxwell

Director of Engineering, Edison Electric Institute

THE making of standards and codes by industrial cooperation is a sort of self-governing legislation by private industry. If the standards produced in this manner are to have lasting effect the process requires the same kind of wisdom and the same active sense of the effect on those governed by the standards as for successful public legislation. Very often such standards and codes are formulated by self-appointed bodies.

It is not necessarily an evil that much of this work should be done by self-appointed bodies. Indeed it is quite natural that special groups such as producers or consumers, or societies devoted to special objects, should be the first to perceive the desirability of standardization in a special field. The truly critical period follows this decision to make a standard when the proponents must determine the scope and effect of the project and whether it is probable that other industrial groups besides those immediately concerned will be affected and if so, whether to proceed to their objective regardless of the effect upon others, or to make the more statesmanlike decision to provide, by appropriate means, that these other affected groups shall have their interests accommodated and thereby secure their collaboration and support.

The necessity for this collaboration is more apparent when it is considered that private standards have no inherent force, there is no moral duty to observe them, and they must therefore commend themselves to industry generally by reason of their excellence alone. On the other hand private industrial codes or standards have an important place in the regulation of business and industry and some of them have attained a good degree of fitness for their purpose while others are notably deficient. The principles applicable to successful standards making are therefore of considerable importance.

Although the electric light and power industry has produced but few formal standards on its own account and only those for the most restricted practical purposes within the industry, it has participated in many projects for standards which affect its business but which have been sponsored by other organizations. In a large number of such projects, not only the electrical codes but in the case of materials standards also, this industry has appeared in the role of critic, sometimes to the vexation of other groups.

The reason for this has been that the electric light and power industry, almost alone, it seems, among the industrial groups that are characteristically consumers, has worked out a fairly definite theory concerning the voluntary standardization process. According to experience this theory does not fit at some points with the corresponding theories, or at least the practices, of many other groups engaged in the cooperative process of making standards. The principal points of this consumer philosophy for standards making may profitably be examined.

Standards Should Be Helpful to All Groups Affected by Them

The first thing to be considered when the question of standardization arises, is whether or not any standard at all is necessary or desirable in a particular case. Too often this preliminary exploration is omitted or lightly passed over on the assumption that any standard is desirable per se. As a matter of fact there are many situations where standards are definitely undesirable, or at the most are useful only in a very limited and mobile form. A standard should serve some useful purpose, if only as a measuring stick. No doubt nearly all standards are intended to be useful to someone but the question then arises whether or not this utility to one shall be at the expense of another. It may be stated as a first general principle that any standard must be advantageous to all who are in any important way affected by its provisions, to justify its existence.

Codes or standards (the two terms are used interchangeably in this article since codes are really standardized ways of doing things) are sometimes urged purely in the interest of orderliness. While this consideration has a certain appeal it is necessary to estimate whether the advantages due solely to an ordered course will compare favorably with the advantages that may be had by flexibility and rapid response to progressive changes. In an industry with a history of rapid growth and still in a period of swift technical change it is but natural that standards that tend to freeze a live and expanding art should be regarded with some misgiving.

Standards Should Have Compact and Limited Scopes

The general principle stated above leads naturally to a second consideration, namely, that the extent and influence of the provisions of a proposed standard, or what is technically called the "scope" of the standard shall be examined and fixed definitely at the outset. Moreover it has been shown by experience that in most cases this scope may be rather severely restricted with advantage to all concerned.

For some reason the proponents of many standards appear to have little appreciation of the great complexity of our industrial civilization and of the fact, which experience records over and over again, that it is nearly impossible to set up an extensive standard in one depart-

ment of activity without affecting many other departments.

For example, there is a well known safety code for overhead electric lines, properly and usefully devoted to the necessary regulations for the safety of persons in this field; the regulations directly affect the cost of the overhead lines concerned. But these overhead lines are the principal element of cost in electric distribution systems and such systems contribute directly to the cost of rendering electric service. Thus this safety code which has nothing whatever to do with the cost of electric service but is devoted to a completely different purpose, does have a substantial effect upon the cost of electric service. Obviously such a situation requires a careful appraisal and a justification for each requirement in order that the actual necessities of safety may be provided without unwarranted cost.

These considerations lead to a second general principle which may be stated as follows: The scopes of projects for standardization should be rigidly restricted to the provisions necessary to achieve the desired object. In general, experience has indicated that it is better to have a number of standards dealing with the various phases of one general subject as the necessity for each appears, rather than to attempt the complete regulation of the subject in one standard. There can be no question as to the practical advantages of this course, the most common error of inexperienced standardizing bodies is to attempt to standardize too much.

The Inherent Validity of Standards

A third consideration which requires attention relates to the important question: What is the authority or validity of a standard? For it must be taken into account that anyone may, if he wishes, write a standard on almost any subject. The ordinary response to this, so far as validity is concerned, is that the standard has validity according to the degree of its use; that is, if it commends itself to the persons concerned with its provisions it will be extensively used and become effectively the standard in its field.

As to authority the case is not so clear; probably there is no actual authority inherent in these private industry standards, except to the extent that they may reflect the state of an art. The most reasonable statement of the case, which is contained in the text of some standards but not in all, is to say in effect "we who have made this standard have set forth what we think are the essential features but anyone is free to choose other methods or materials if equally good results are obtained." This sounds plausible and actually is a fairly good statement, but it is somewhat tricky because it implies some authoritative judgment of the result to be obtained.

In the field of materials standards this is not especially important because tangible materials are dealt with and questions may be resolved by measurement. The codes are quite different, because their purpose, in general, is to attain certain definite results, such a the abatement of eye-injuries or other physical hazards. There is a sharp difference in the approach to this subject, some, including the electric light and power industry, maintaining that the essential part of a code requirement is a plain statement of the result to be achieved while the means is relatively a minor part—others appear to be concerned primarily with means and to make matters more difficult, show a marked preference for standardizing one out of many possible means for reaching the same result.

The reason for the foregoing discussion is that one of the major problems, closely connected with the matter of authority, is to popularize standards after they are made in order to bring them into general use. The most potent factors that promote conformity are of a commercial nature; nearly all standards that have extensive acceptance, particularly the codes, have important effects upon commerce in the commodities and upon the labor with which they deal, although these same standards rarely if ever, purport to deal with such matters, but have some other and generally quite different main objective. Many commodities are manufactured, and many contracts are made, to agree with the provisions of existing standards. In such cases there are substantial reasons why those so engaged should be interested in the perpetuation of a standard. The administrators of standards also naturally do their utmost to procure conformity but unfortunately although perhaps naturally, conformity tends to be identified with resistance to change.

All of these considerations may lead to a powerful movement toward conformity with standards that often goes far beyond the actual validity of the standards concerned, or any authority really inherent in them. This might be a tolerable state of affairs if the standards were in fact the final word in wisdom and did in fact make the most equitable provisions possible for everyone affected by their provisions. For quite obvious reasons this ideal condition rarely exists. What with the activities of "pressure groups" who must be recognized, and the human limitations of the individuals concerned, most codes are measurably deficient compared with what they might be if they were written by a few highly qualified experts.

From consideration of these circumstances the electric light and power industry has been led to a conclusion which may be stated as a third general principle, as follows: Standards at best should be regarded only as guides to practice, they have no inherent authority when the facts in a particular case indicate a course different from that prescribed by the Standard. In practice, this suggests that in cases where standards are wisely formulated and provide reasonably well for all interests concerned, they may well be followed for the sake of order and mutual accommodation. But where they do not attain to this degree of excellence, there is no moral or other obligation to conform blindly, in fact the moral obligation, so far as there is one, is in the other direction, that is to say toward the facts of the situation rather than toward conformity. There are in fact judicial decisions to the effect that, where a standard did not agree with prevailing expert testimony concerning the state of an art, the standard had no particular force of its own to affect the situation.

The Problem of Conformity

A by-product of the problem of conformity or non-conformity may be found in the more or less systematic misuse of standards for selfish ends. It requires great skill in drafting to state the requirements of a standard in such a manner that they will accomplish their object and no more. Every word or phrase beyond this necessity provides a toe-hold, so to speak, for anyone who is inclined for one reason or another, to cause the verbal tail to wag the essential requirement dog. It happens rather frequently that some interested group will derive from the precise wording of a requirement some word or phrase or particular form of words that provides for it either an actual although unintended advantage, or an apparent advantage over others. Not unnaturally such groups become enthusiastic supporters of the particular phrases that aid them and in

(*Continued on page* 376)

Personnel of E. E. I. Committees for 1938-1939

APPOINTMENTS to E.E.I. Committees for the administrative year 1938-1939 have been made by President Kellogg, with the exception of the Sales Committees whose membership will be announced in a subsequent issue.

The committees which now have practically complete personnel include the following: Operating; Accident Prevention; General Accounting; Classification of Accounts; Customers' Relations, Commercial Accounting and Collections; Depreciation; Plant Accounting and Records; Purchasing, Stores and Transportation; Electrical Equipment; Hydraulic Power; Insurance; Membership; Prime Movers; Prize Awards; Rate Research; Statistical; Transmission and Distribution.

Several of the committees have already fixed dates for their fall meetings, as listed in the Convention and Meetings section of the BULLETIN, and others will be announced shortly.

The personnel of the Operating Committee is listed on the inside of the back cover of the BULLETIN. Personnel of other committees follow:

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Byllesby Prize Paper

Problems and Suggested Solutions Relating to the Electric Plant Acquisition Adjustment Account

By C. A. McKenna

WHILE utility accountants were absorbed with the problem of maintaining a sound financial position in a period of economic stress, many of the regulatory bodies were collaborating in the preparation of a new classification of accounts. As a result, the former now find themselves facing a new classification with practically no time in which to exchange opinions regarding some of its new and unusual features. Plant accounting is particularly blessed with new ideas, the trend of which is set forth—not too clearly—in the Uniform System of Accounts as prescribed by the Federal Power Commission. The requirements of this classification merit its study by each utility accountant even though his organization may not, at the present time, be subject to the jurisdiction of that regulatory body. This is particularly true when one considers that the Federal Power Commission, in common with other Federal bureaus and commissions, is continually increasing the scope of its jurisdiction, and since an increasing number of state commissions are adopting the Federal classification.

One of the new accounts to be found in the Uniform System of Accounts prescribed by the Federal Power Commission is known as the "Electric Plant Acquisition Adjustment." Briefly, this account is supposed to reflect the difference between the cost of property acquired and the original cost of the property to the person first devoting it to the service of the public. The accountant faced with the problem of determining the amount to be reflected in this account, either as a charge or a credit, must bear in mind at all times that it is not sufficient for him to determine the mere dollar difference between the cost to the accounting company and the original cost. He must determine, as accurately as possible, what this difference represents—not only because providing certain detailed information is mandatory under the Federal Power Commission requirements, but also because either the adequacy or absence of specific information will no doubt influence the attitude of a court of law in case of failure to reach an agreement with the regulatory bodies regarding the retaining, as a cost of plant, such items as Going Value, Water Power Value, and the like.

MR. McKENNA

Mr. McKenna is winner of the Second H. M. Byllesby Prize for 1938.

Following his graduation from Northwestern University in October, 1929, Mr. McKenna became employed by the Wisconsin Public Service Company at Menominee, where he remained until 1933. In May of that year he was moved to Milwaukee where he did special accounting work. In July, 1935, he was placed in charge of the fixed capital audit which is being conducted at Green Bay.

Since coming to Green Bay, Mr. McKenna successfully completed the examination for certified public accountant and recently was elected Secretary-Treasurer of the Northern Wisconsin Chapter of the Wisconsin Society of Certified Public Accountants.

Most utility companies operating today are an outgrowth of a combination of several smaller units through consolidation, merger, purchase, or liquidation. As a result of this transition to larger operating units, it is not unusual for the property accounts as reflected on the books of the vendee company to vary from those appearing on the books of the vendor company. Such variance was often caused, not by the inflation of property values, as so many people in public life would have us believe, but by the change in price levels between the date of construction and the date of sale, and by the demand of the original owner for a somewhat higher price for his property as a just reward for whatever business acumen he may have displayed in developing the property into a well-organized operating unit. Although it may be advisable to segregate these differences in order to facilitate the operation of a plant accounting system—particularly one based upon unit accounting—they still have a definite place in a rate base. The accountant must not lose sight of the fact that cost to the accounting company is just as important as original cost. So long as the vendor and vendee were not affiliated but were dealing at arm's length, and there is no indication of fraud, it is reasonable to assume that the transaction was actuated by ordinary commercial interests; and the security holders who made such a venture possible must be protected even though subsequent events may cause current observers to feel that they would have handled the transaction more wisely.

Generally speaking, property acquisitions by an operating utility will fall into two groups: first, those consummated by means of merger,* and second, those accomplished by the purchase of physical properties. In the latter case, there will usually be some detail available as to the property acquired and the basis used in arriving at the value as of the date of purchase. In the former case, however,

* For the purpose of this paper the technical distinction between merger and consolidation will be ignored, and the term *merger* will be used to embrace both types of transaction.

it is necessary to rely upon the underlying company's records, which are often incomplete or lacking in detail, particularly for the early days of the electric industry.

In dealing with property acquisitions as a result of a merger, the accountant must start by determining three figures upon which to base the balance of his study. These are:

(1) The cost to the accounting company of the property and plant acquired.

(2) The original cost of the property and plant acquired (in many cases estimated).

(3) The amount at which the property and plant is recorded on the books of the accounting company.

Assume that the merger of two or more companies has resulted in the following figures:

Cost to the accounting company (net)	$5,000,000
Estimated original cost (net)	4,500,000
Amount at which recorded by accounting company (net)	5,300,000

The latter amount is the same as that appearing in the property accounts as carried on the books of the predecessor companies.

In the above case, we have assumed that the accounting company recorded the property and plant accounts on its books at the same value at which they were carried on the books of the predecessor companies although the payment was less than that amount. Since the accounting company paid less than the book value, the presumption is that it did not consider the plant accounts to be conservatively valued, and it is more than likely that regulatory bodies will order the difference of $300,000 charged against whatever account received the original credit. Of course, if it is possible to show that the original cost is equal to the recorded amount, the difference will appear as a credit balance in the Electric Plant Acquisition Adjustment account.

Unless the records of the predecessor companies are unusually elaborate, the determination of original cost is in itself more or less a guess. Generally speaking, utilities as well as industrial organizations did not concern themselves to any great extent with detailed records prior to the advent of the Federal Income Tax Law in 1913. However, some states—notably Massachusetts in 1885, and Wisconsin and New York in 1905—had started the state commission form of regulation so that some of the records before 1913 are fairly accurate and reliable. For records prior to that time, one must often depend upon appraisals, minutes of directors' meetings and such supplemental information as is available. Ordinarily, the starting point will be the property as it appears in the earliest available appraisal that meets the approval of both the company and the regulatory body. To this figure should be added the net additions to the date of transfer, and the total, after any obvious adjustments have been made, will approximate as closely as possible the original cost.

The disposition of the difference between the original cost and the cost to the accounting company is a subject with very little precedent at the present time. Section C of the Electric Plant Acquisition Adjustment account states, "The amounts recorded in this account with respect to each property acquisition shall be depreciated, amortized, or otherwise disposed of as the Commission may approve or direct." Recent decisions** have shown that the courts will be inclined to give weight to the evidence that the accountant may present to justify either the retention or the proposed ultimate disposition of items included in the account. With this thought in mind, it is well to consider the means of determining some of the causes underlying the differences.

The example cited shows a difference of $500,000 between the cost to the accounting company and the estimated original cost. This, however, is a net figure and does not of necessity represent the amount of the Electric Plant Acquisition Adjustment. Thus, in the example previously used, we might have the following situation:

Cost of gross property and plant acquired	$5,700,000	
Estimated original cost of gross property and plant acquired	5,250,000	
Excess of cost of gross property over its estimated original cost		$450,000
Estimated original reserve	$750,000	
Recorded reserve	700,000	
Excess of estimated original reserve over recorded reserve		50,000
Excess of cost of net property over estimated original cost		$500,000

In this hypothetical case, the assumptions are made that at some point in the history of the accounting company, the records of one or more of the merged companies were not sufficiently detailed to provide all the information necessary and that knowledge as to property existing prior to that time was supplied by an available appraisal. Thus, the difference between the reserve figures above is supposed to represent the amount by which the observed depreciation exceeded the recorded reserve at the date of appraisal.

Electric plant instruction number two of the Federal Power Commission classification of accounts reads as follows:*** "In ascertaining the cost, *it is not* intended that any correction need be made for depreciation or amortization applicable to operating units or systems previously acquired, whether or not such depreciation or amortization was recorded in the books of the accounting utility." Thus, the difference between the reserve figures would be ignored and the Electric Plant Acquisition Adjustment would amount to $450,000, all of which would be applicable to the gross plant account. The situation, however, would not be the same in the state of Wisconsin. The Uniform System of Accounts promulgated by the Public Service Commission of Wisconsin takes an opposite stand, their instruction on the same subject reading as follows:*** "In ascertaining the cost, *it is* intended that any depreciation or amortization and contribution in aid of construction at the date of acquisition, applicable to operating units or systems previously acquired, shall be recorded in the books of the accounting utility." It therefore appears that in the latter case the Electric Plant Acquisition Adjustment would amount to $500,000 of which $450,000 would be applicable to the gross plant account and $50,000 applicable to the reserve account.

Obviously any attempt to dispose of the amount of Electric Plant Acquisition Adjustment pertaining to the depreciation reserve will be surrounded by innumerable obstacles. The problems involved in depreciation accounting are too complicated to be discussed here, but one cannot pass on without mentioning that, although the Federal Power Commission does not specify any particular method of depreciation accounting, some of the state regulatory bodies distinctly state that the straight line method shall

** New York Edison Company v. Maltbie, 244 App. Div. (N.Y.) 685 American Telephone & Telegraph Company v. United States, et al.

*** Italics, the author.

be used. The accountant of course must be governed by the rules of the particular regulatory body having jurisdiction over the company he represents. It is worthy of note, however, that at least some of the state classifications specifying straight line depreciation offer an alternative provided the accounting company can produce evidence to show that a different method is adequate for its needs. The accountant faced with the task of determining the adequacy of both past and present reserves must make a distinction between the two. He must not let the current trend toward depreciation accounting and more particularly, straight line depreciation accounting, obscure the fact that past policy favored retirement accounting. The existence of so many varied opinions regarding the basis for past reserve appropriations should lead him to oppose all adjustments of such appropriations except perhaps where there is proof either of fraud or of lack of good faith. So far as current reserve appropriations are concerned, it is apparent that the straight line method is not the answer and that the field of depreciation and retirement accounting is one in which the accountant has yet to do his best work. In carrying on this work, he will no doubt find it advantageous to resort to accounting and engineering studies rather than to ancient court decisions which are rapidly falling into disrepute.

The balance of $450,000 in the Electric Plant Acquisition Adjustment account may represent several items. To enumerate but a few, the analyst may find the following:

1. Going Value.
2. Water Power Value.
3. Changes in Price Level.
4. Unrecorded Retirements.

In detailing with matters pertaining to the rate base, the courts have always recognized an element of Going Value, either as a separate item of value or as an item to be given consideration in valuing property as a going concern. It is only natural, therefore, that buyers and sellers would also recognize such an element of value in transactions involving the transfer of utility properties. Thus, by closely scrutinizing the transactions involving the acquisitions of predecessor companies, the accountant may be able to identify an item of Going Value. This should be segregated as one of the items to be retained in the adjustment account.

A detailed study of the plant account will often disclose items representing Water Power Value. Although the regulatory bodies of former years were inclined to recognize such value as an asset, some of their successors of the present day are inclined to favor its elimination. The accountant therefore must produce evidence to support his stand, if he wishes to retain such value. This he can often do by studying the files and records pertaining to either the issuance of securities or the authorizations covering the conveyance of assets. In many cases he will find that previous regulatory bodies have authorized security issues based upon their own recognition of Water Power Value. If such evidence can be produced, it seems reasonable to retain such amounts at least until the plant involved ceases to exist.

A comparison of price levels during periods of construction as related to price levels at the time of purchase will often disclose causes for the variance between the historical cost and the cost to the accounting company. Any amount in the adjustment account arising as a result of purchase at a price level higher than that existing at the time of original construction should be written off over the life of the associated property. In order to avoid distorting a unit record, this association should be obtained by applying a percentage sufficient to absorb the excess.

Many years ago, it was not an uncommon practice to credit the property account with the salvage received as a result of abandoning property and to ignore any further retirement entry. This procedure was not the result of an attempt to inflate the plant accounts, but was the result of a lack of accounting knowledge. Many of the major abandonments of this nature can be traced by referring to the records of salvage and by examining the minutes of the directors' meetings wherein reference is often made to property abandonments. Such amounts of course should be charged to the depreciation reserve.

As previously mentioned, the direct purchase of physical properties is usually adequately supported by detail regarding the basis of valuation and the like. In such cases, the determination of the Electric Plant Acquisition Adjustment is simplified, but some of the problems are none the less real. If the property was acquired from an organization not classed as a public utility and the accounting company was the first to devote it to the public service, the purchase price represents the "original" cost and may be recorded on the books as such. If the vendor company was a public utility, the basic figures to be used will be the same as in the case of a merger —namely, the cost to the accounting company, the original cost, and the recorded cost.

Cost to the accounting company in this case means the consideration given in exchange for the property acquired, and may represent either the original cost less depreciation, the cost of reproduction less depreciation, or perhaps some basis only vaguely resembling original cost as in the case of sales resulting from reorganization. In any case it will be necessary to determine the original cost either by referring to the vendor's books or by estimate, and to substitute the gross value and reserve so determined for the cost to the accounting company, carrying the balance to the Electric Plant Acquisition account. Here again it is assumed that the gross value will be used in order to facilitate the ultimate reduction of the plant account to units.

Usually the recorded cost will represent the cost to the accounting company plus the expenses of acquisition. The expenses of acquisition cannot be included with the original cost and must therefore be transferred to the Electric Plant Acquisition Adjustment account. There is one exception, however, and that is the expense connected with the clearing of titles to land. Many small organizations are lax in that they do not make careful checks to assure a clear title to land. If as a part of the cost of acquisition, the vendee company finds it necessary to make expenditures to secure quit-claim deeds and abstracts of title, or to have the title examined, in order to comply with its own mortgage requirements, sound accounting dictates that such items should be segregated and be permitted to remain as a cost of land rather than to be transferred to the adjustment account.

In the preceding paragraphs, an attempt has been made to point out some of the more general types of problems to be encountered in reclassifying property acquisitions in accordance with the Federal Power Commission classification of accounts. The comment regarding their treatment is the author's opinion and it is not advanced as the final solution. It is hoped that the treatment of such items will become the object of an active exchange of ideas between utility accountants to the end that we may all help to produce logical and fair solutions to the many vexing problems arising out of the new theories confronting us.

McGraw Prize Paper

A New Technique in the Maintenance of Oil Circuit Breakers

By S. Goldsmith and R. M. Seitz

MR. GOLDSMITH

This paper, which won the Second James H. McGraw Prize for 1938, was written jointly by Messrs. S. Goldsmith and R. M. Seitz of The Cincinnati Gas and Electric Company.

Mr. Goldsmith received the degree of Electrical Engineer from the University of Cincinnati in 1928. In 1927 he entered the employ of The Cincinnati Gas and Electric Company in the Electrical Test Department as a cooperative student. In 1929 he was transferred to the Operating Engineering Department. In 1934 he became Protection Engineer and in 1936 Operating Engineer, the title he now holds.

Mr. Seitz received his grammar and high school education in Buffalo, N. Y., and the degree of Electrical Engineer from the University of Cincinnati in 1931. In 1925 he entered the employ of The Cincinnati Gas and Electric Company as a cooperative student. From 1931 to 1936 he supervised the work in the special test group of the Operating Department and in 1936 he was transferred to the Operating Engineering Department.

MR. SEITZ

THE oil circuit breaker is a device of major importance in the operation of modern power systems. In economic value, it represents a considerable part of the total cost of the facilities for the generation and distribution of electrical energy and upon its proper functioning depends the safety of the personnel, protection to other equipment involved, and the continuity of service to the public.

The oil circuit breaker has been undergoing a gradual process of development from its early beginning. Originally, it was a crude device whereby a set of contacts carrying current was opened in a container filled with an insulating oil. In contrast, the modern oil circuit breaker in the larger sizes contains a complex system of linkages, springs, cams, solenoids, contacts, arc control devices, and auxiliary equipment, usually mounted on a massive frame. Due to its size and speed of operation, it must be equipped with effective shock absorbing mechanisms. Although of rugged construction, the modern oil circuit breaker must be a precise piece of equipment. Each of its parts must function within definite narrow time limits if its circuit breaking function is to be performed without excessive shock to the system on one hand or without destruction to the equipment itself on the other.

In the past, the maintenance man who was intrusted with the maintenance and adjustment of this type of equipment has had little to guide him in determining whether the equipment was in proper adjustment. The usual practice for many years has been to "time" the breaker with a cycle counter. This merely determines that the time from the energizing of the control devices to the making or parting of the first contact to make or break is within certain limits. This point in the operation of modern types of arc interrupters, while important, is only a small part of the sequence of operations which must be performed perfectly to obtain successful arc interruption. The usual procedure has been to consider that the adjustments are correct if this "time" is within limits, if the minimum close and trip voltages are within a standard, and if the stops were correctly set and the contacts made properly.

Some years ago, the company with which the authors are connected performed extensive interrupting capacity tests on oil circuit breakers with various types of arc interrupting devices. These clearly showed that the speed at which the contacts were being separated after the arc was drawn was one of the most important factors in arc interruption. This speed was shown to vary for different types of arc control devices and while some operated fairly well over a wide range, others required quite definite speeds to perform effectively. It was then seen that this factor was being entirely neglected in the normal maintenance practice. A device was, therefore, developed by the authors to enable this information to be obtained easily and accurately in the field. After several years' use, it has proven itself valuable not only for the original purpose, but also as a means for obtaining a thorough check of the mechanical condition

of all parts of the breaker with the added feature of obtaining a permanent record of the condition at the time of overhaul.

Analysis of Oil Circuit Breaker Operation

To understand just what the method involves, it is necessary to briefly analyze the function of the various parts of a conventional oil circuit breaker and to see what defects may develop.

Trip Mechanism

The trip mechanism usually consists of a solenoid and plunger which in moving trips a latch or upsets a system of toggles. After the solenoid is energized, time is required to build up the magnetic flux and cause the plunger to move. For best operation, the plunger should hit the unlatching mechanism with a hammer blow, after which the main mechanism should start to move immediately. The important adjustments in connection with this portion of the mechanism are concerned with keeping the time from energizing the trip mechanism to start of movement within narrow limits. If this time is longer than normal, it indicates one or more of the following:

(a) The trip plunger is set incorrectly in relation to the latch.
(b) Friction is present in the latch or latching mechanism.
(c) Shorted turns have developed in the solenoid.

If this is much shorter than usual, it indicates that:

(a) The latching mechanism is not seating properly, or
(b) The accelerating springs are not set properly since the pressure on the latch has weakened. This is indicated in another part of the operation also and is taken up later.

Accelerating Springs

The function of the accelerating springs is to impart an initial velocity to the contacts after the mechanism is unlatched and to speed them up at definite points in the opening stroke. Since the important point here is to have the contacts move with a certain speed over a certain portion of the arc path, it is essential to determine this speed in the maintenance procedure. If it is too fast, the arc will usually be drawn out to lengths not intended by the designers and if too slow, excessive time of arcing will develop, resulting in high gas pressure, in addition to excessive oil and contact deterioration.

The cause of a decrease in speed may be due to excessive friction in the linkage or fatiguing in the springs or the springs may have broken.

Shock Absorbers

The high capacity oil circuit breaker moves with such momentum and must be stopped so quickly that some shock absorbing means must be provided. If a breaker is so equipped, it is essential that they be adjusted with care. It is obvious that if the shock absorber should take hold while the breaker is still drawing out the arc, disastrous results might follow. In the other extreme, if the shock absorbers do not properly cushion the mechanism, the contacts may rebound sufficiently to restrike the arc. The essential point here then is to determine where the shock absorbers are starting to take hold and how much rebound is taking place.

Several faults may develop in shock absorbers. If they are of the liquid or air dashpot type, gaskets may become worn or the portholes may be clogged or pistons and links may be damaged. If of the rawhide buffer type, the rawhide may be old and hard. All of these defects will show up if a record of the actual action is obtained.

Closing Mechanism

The closing mechanism usually consists of a large solenoid or motor operating the moving contacts through a system of links and levers. If of the solenoid type, too long a time from energizing to movement of the mechanism indicates one of the following conditions:

(a) The air gap in the plunger is not adjusted properly.
(b) The magnetic air gaps in other parts of the circuit have increased.
(c) The closing coil has shorted turns.

If the speed is too slow at the end of the closing operation, it indicates that the toggles are not properly adjusted, provided the accelerating springs are correct.

Test Equipment and Procedure

From the foregoing it is seen that if a complete record is obtained of motion versus time of the moving contacts, all of the adjustments mentioned above may be easily checked. The device which was developed to obtain this record in the field consists essentially of two main elements:

(1) A vertical drum carrying a ruled chart and driven by a synchronous motor through a suitable gear reduction.
(2) A mechanism carrying a pencil which is operated along the vertical portion of the chart by the lift rod of the oil circuit breaker through a reducing mechanism.

The rotary motion of the drum being driven past the pencil at synchronous speed gives time in cycles as the abscissa on the chart, while the ordinate of the chart represents the travel of the oil circuit breaker contacts. The drum also carries contacts which always energize the closing or trip circuits at the same point on the ruled chart. Suitable relays are provided to seal in these contacts and to obtain other control functions. The chart is provided with a gummed end so that it may be easily attached to the drum.

Two speeds of the drum are provided. The heads carrying the reducing mechanism and pencil mechanism are interchangeable and different types of heads are used on various types of breakers. This is necessary due to cell limitations, bushing arrangements, etc. It requires only a few minutes to interchange heads.

The whole mechanism is so compact that it may be easily mounted on a breaker in a cell. The procedure is to mount the device in such a position that the movement of the lift rod can be transmitted directly to the main slider. A connection is then made between the two by means of a 3/16" rod of the proper length, which is screwed into the jam nut on some types of breakers or into drilled and tapped angle brackets attached to the lift rod on other types. Once a breaker has been equipped to take the device, it is unnecessary to drop the tanks or to disturb it in any way to obtain a record.

The maintenance men are provided with transparent templates from which the speed can be read directly from the slope of the curve. They are also provided with a chart showing the limits for each portion of the operation.

The photographs show the mounting of the device in typical installations. Figure 1 shows the device with a "14-inch" head mounted on a 15 kv General Electric type FK-130 oil circuit breaker; Figure 2 shows it with an "F-8" head mounted on a 15 kv Westinghouse 0-22-A oil circuit breaker; Figure 3 shows it with an "F-8" head mounted on a 15 kv Condit type F-116 oil circuit breaker; and Figure 4 shows it with a "24-inch" head mounted on a Westinghouse type G-222-A oil circuit breaker.

Results

Figure 5 shows a typical time travel chart taken on a tripping operation.

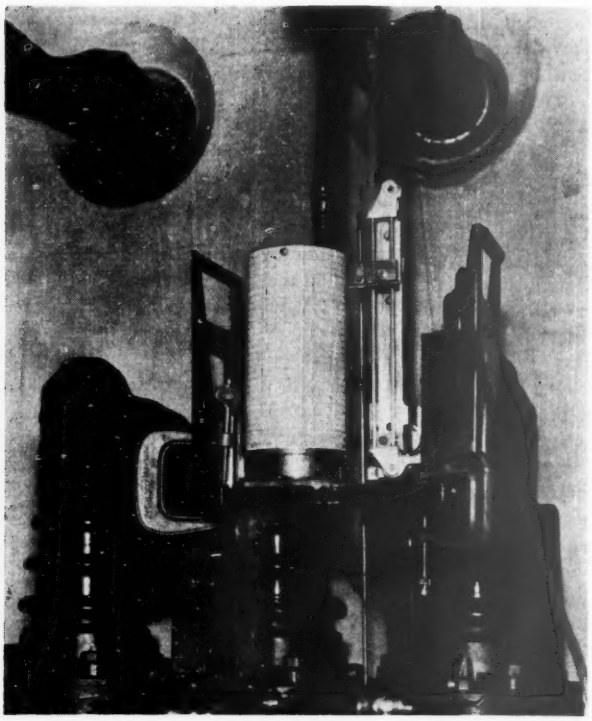

Fig. 1—Travel device with "14-inch" head mounted on a 15 kv. G. E. Co. Type FK-130 O. C. B.

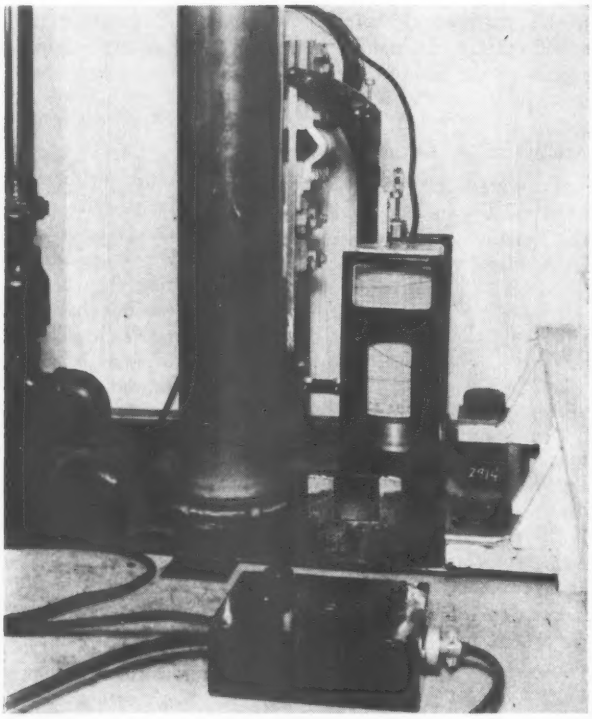

Fig. 2—Travel device with "F-8" head mounted on a 15 kv. Westinghouse Type O-22-A O. C. B.

Fig. 3—Travel device with "F-8" head mounted on a 15 kv. Condit Type F-116 O. C. B.

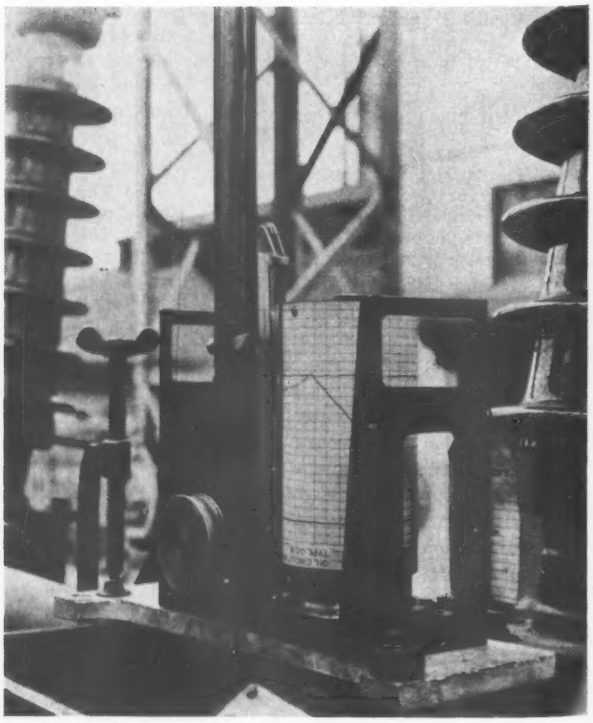

Fig. 4—Travel device with "24-inch" head mounted on a 66 kv. Westinghouse Type G-222-A O. C. B.

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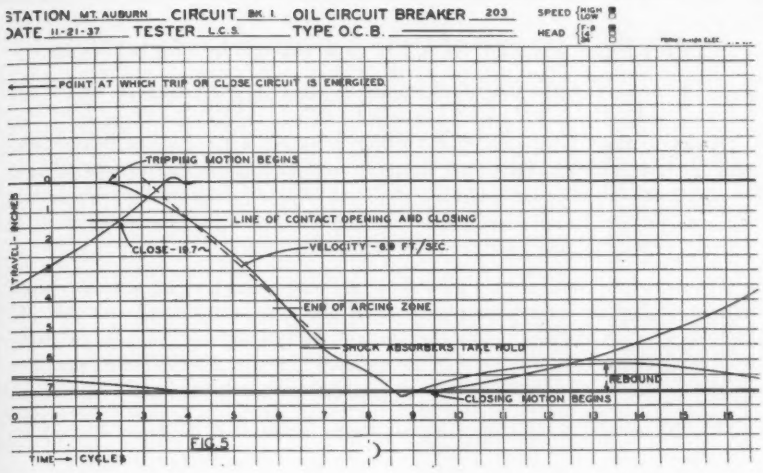

Fig. 5

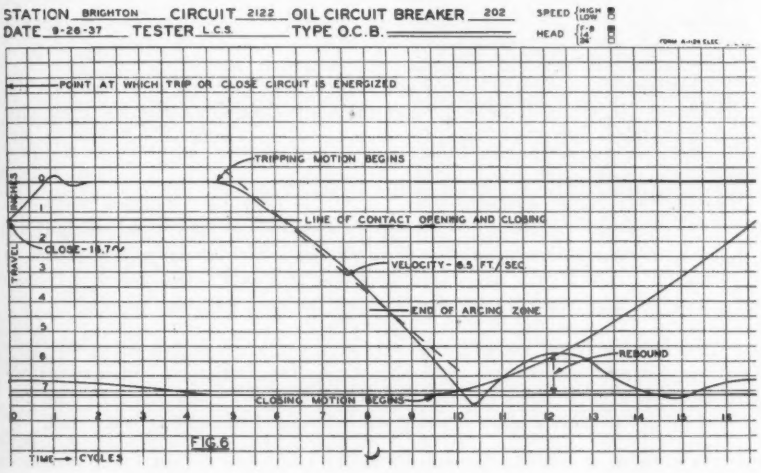

Fig. 6

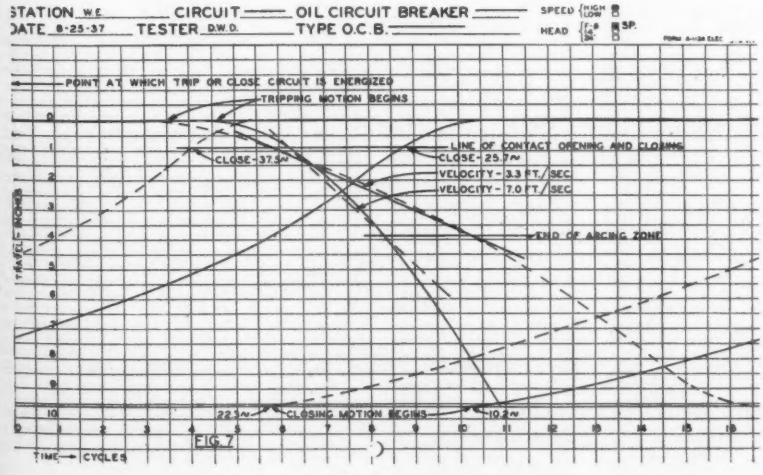

Fig. 7

This chart was taken by a maintenance man in the field with no technical assistance. It shows a correctly adjusted breaker and conforms with the recommendation chart furnished in the following respects: Time from energizing of trip coil to start of motion 2.3 cycles, to parting of contacts 4.1 cycles, to end of stroke 8.7 cycles. Speed of contacts in arc zone 6.9 feet per second. Shock absorbers take hold at 5.6 inches from closed position. Rebound of mechanism is 0.9 inch. Full stroke is 7.1 inches.

This chart also shows the closing operation taken at the same time. It shows: Time from energizing of auxiliary closing relay to start of movement 9.3 cycles, time to making of contacts 19.7 cycles, time to full close 20.7 cycles. Overtravel is 0.2 inch. The speed does not decrease at the time of or after making of contacts, but is maintained up to the full closed position, indicating correct adjustments of toggles.

Both the closing and trip curves are normal and show no signs of excessive friction at any part of the operation. With the obtaining of such a curve on an overhaul, no further mechanical adjustments or tests would have to be made with the exception of adjustment of contact surfaces.

Figure 6 shows a time travel curve taken on a breaker which was not correctly adjusted. The time of 4.7 cycles from energizing of trip coil to start of motion is excessive. An examination of the curve will show that this is not due to friction in the main mechanism as the motion is fairly rapid after it is once started. It is clearly seen that the difficulty is in the trip mechanism itself. In this particular case, unhardened latches had been furnished and these had become burred. The plungers in the trip coil mechanism were also found to have become rusted. Examining the curve further, the speed of 6.5 feet per second in the arcing zone is below the standard. There is no evidence that the shock absorbers are taking hold and therefore the rebound of 1½ inches is to be expected. The required adjustments are thus immediately made apparent.

Figure 7 is interesting in that it shows the use of this test procedure in the acceptance test of new equipment. The solid tripping curve shows the contract specifications on a number of high capacity oil circuit breakers recently purchased from one of the larger manufacturers. These were installed by the manufacturer's service shop employees and were considered satisfactory when

they were turned over. The dashed curve shows the actual performance. It is obvious that there is a vast difference between the two, but this would not become apparent on a cycle counter "timing test." When this material was presented to the manufacturer, he readily agreed that the performance was unsatisfactory, but was able to so shorten links and readjust springs in the field that the performance was brought within satisfactory limits in a short time.

Figure 8 shows an interesting case of incorrect design not in the circuit breaker itself, but in the system of auxiliary and trip-free relays connected with it. The curve shows a closing operation taken with the protective relays held in the closed position. If the curve is followed, it is seen that the breaker closes, is immediately tripped, remains in the full open position for about 30 cycles, and then is reclosed. It is apparent that the fault lies in the control circuits. In this case, a combination of a time delay dropout closing contactor and an instantaneous trip-free relay was found to be incorrect.

Conclusions

As the results of several years' experience with the methods outlined above in the maintenance and adjustment of oil circuit breakers, the following conclusions can be drawn:

1. The correct adjustments of each individual part of an oil circuit breaker are important in obtaining maximum performance.

2. A time travel curve, if correctly analyzed, will indicate all mechanical maladjustments with the exception of contact alignment.

3. It is essential that this time travel curve be obtained on a complete unit either in its normal position or on a test rack.

4. If a suitable device is available, the time travel curve may be obtained much easier and within a shorter time than by the use of cycle counters, mercury, dashpots, or by the use of an oscillograph.

5. The record so obtained is not only immediately useful to the maintenance man, but also serves as a valuable office check and record of the condition of the unit "as found" and "as left."

6. The average maintenance man can be quickly trained in the new method.

7. The equipment used is sufficiently compact and rugged for field use in the hands of ordinary workmen and is relatively inexpensive.

THAT 18 CENT RATE AT WARM SPRINGS

From the New York Herald Tribune, Aug. 14, 1938

"ATLANTA, Aug. 13.—Preston S. Arkwright, president of the Georgia Power Company, declared today that President Roosevelt, who complained that in 1924 he paid 18 cents a kilowatt hour for electric current in his Warm Springs home, was patronizing a municipally owned plant at the time and not Arkwright's company, which at present is supplying the power for 1.9 cents a kilowatt hour.

"Mr. Arkwright declared the President in 1924 was getting his current from a small Warm Springs company which purchased its power from a city-operated plant in Manchester, Ga. The Georgia Power Company, he said, did not take over the Manchester plant and the Warm Springs Service until 1929 and since that time the price to the President and the Warm Springs Foundation has continued to drop.

"The President's reference to the 18-cent charge was made in his recent Barnesville, Ga., speech.

"Mr. Arkwright's statement follows:

"'In his speech at Barnesville, President Roosevelt said that when he first came to Georgia, he had to pay 18 cents a kilowatt hour for his electric service at Warm Springs. It was this very high charge for electricity, he said, which first aroused his interest in public utility rates.

"'I am confident that Mr. Roosevelt did not intend to leave the impression that the 18-cent rate was charged him by the Georgia Power Company, for he has repeatedly praised the lowness of this company's rates in conversation with me and other people. In fact, the lowness of our rates was one of the reasons Mr. Roosevelt offered in urging us to acquire the electric properties at Warm Springs.

"'The situation is that when Mr. Roosevelt first came to Georgia he obtained his electricity from a little company in Warm Springs which bought its power from a municipally owned electric plant then being operated in Manchester, Ga. It was that little company which charged Mr. Roosevelt 18 cents a kilowatt hour.

"'The Georgia Power Company took over these properties in 1929 and at that time first began supplying electricity to Mr. Roosevelt. The application of this company's regular rates brought about an immediate drop in the price Mr. Roosevelt paid for electricity to 3.87 cents a kilowatt hour, and it has continued to drop since then.

"'At the present time Mr. Roosevelt is buying his electricity from us at his home, the Little White House, for 1.9 cents a kilowatt hour and the Warm Springs Foundation is paying an average of only 1.6 cents a kilowatt hour'."

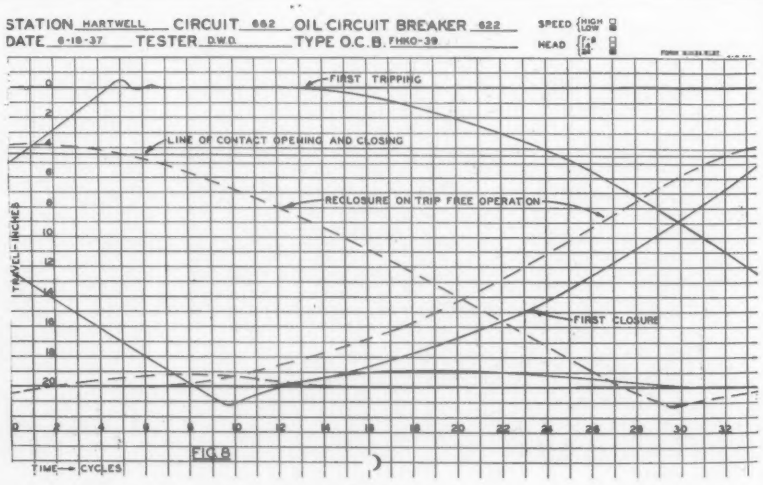

Fig. 8

Byllesby Prize Paper

The Organization of a Property Record Department of a Public Utility Company

By Walter L. Squire

IN organizing a department of a large public utility company for the purpose of maintaining a suitable record of the Plant Account, there are, fundamentally, only two methods employed.

One form of organization is to divide the department into groups, each of which performs a particular function or functions for all the geographical districts into which, for operating convenience, the properties of the company have been divided.

The other method is to divide the work vertically instead of horizontally and have each group perform all functions of the work for a single geographical division.

The labor movement provides a good analogy. The former method is similar to the trade union and the latter follows the idea of the vertical union.

The writer believes that the vertical form of organization has many distinct advantages which have not been realized on account of the modern trend towards the adoption of factory mass production methods in the office. The purpose of this paper is to compare the advantages and disadvantages of the two forms of organization.

The functions and the scope of the work of the Property Record Department which we are considering may be summarized as follows:

1. Checking all orders issued for work to be done for proper cost estimates, accounting, approval and description of work.
2. Preparing detailed cost records of each order from invoices, stores issue records, payrolls and other sources.
3. Making a field inventory of the equipment installed on each order or group of orders.
4. Preparing statistical analysis of the changes in the Plant Account for taxation purposes.
5. Preparing final report of the cost of additions to the Plant Account. This operation includes a study of the scope of the work on each major order, a comparison of the estimate with the actual cost, reconcilement with the inventory and a comprehensive description of the facilities added to the system.
6. Making retirements to Plant Account for equipment removed or taken out of service.
7. Special reports and studies.

MR. SQUIRE

Mr. Squire is the winner of the Third H. M. Byllesby Prize for 1938.

He received the degree of Civil Engineering from Cornell University.

Mr. Squire has been employed in the Property Records Department of the Buffalo Niagara and Eastern Power Corporation since October 9, 1930.

Considering first the horizontal division of labor method, there would be seven separate groups in the Property Record Department as described above by the kind of work each would do.

The principal advantage of this arrangement is standardization. One group performing the same operation for all operating divisions will develop a standard method. This is of great value, especially during the expansion period when many companies with different accounting systems are being merged.

The disadvantages of the horizontal organization include the following:

1. Each operation becomes more or less mechanical.
2. Spreading the work of each group over the entire territory in which the company operates makes it almost impossible for the people in the group or even the one in charge of the group to see the construction work or get acquainted with the men in the field offices who plan, perform and record it.
3. Each group is concerned with its own particular function and the tendency is to make each job conform to a standard method of recording an operation without regard to varying conditions.

Under the second or vertical division of labor method in this Property Record Department, each group would be assigned to perform all the seven operations for a certain territory, that is, one group of employees, under a competent leader, would issue the orders for work to be done, make the accounting of the cost of each order, take the inventory, prepare the tax schedules and the final reports of Fixed Capital added or retired.

The advantages of this arrangement include the following:

1. The goal of each group would be a job or a unit of property to be added to the system instead of a single monotonous operation to be repeated hundreds or thousands of times without knowing what it was all about. When a request for an order is made, the leader of the group in whose territory the work was to be done would, in checking the order in the usual way, find out all about the job. On a job of any size or importance he would talk with the engineers, examine drawings, learn what materials were to be purchased, which particular construction crews would do the work, and later see the work during construction. Then when the second operation, or the recording of the direct labor and material cost, began, he would be able to make a more intelligent analysis of this cost. The next step would be the inventory, which, with the knowledge of the work already possessed by the leader of the group or one of his assistants to whom the job had been assigned at the start, would be a simple proposition. The same applies to the tax record and the final reports.
2. Under this system, the man in charge of a group and his first assistant would know their property. They would know the engineers who designed it, the men who built it, and the field office men who make the records.
3. This arrangement would tend to develop many more capable employees. Few people can get interested in, much less work up enthusiasm over, an operation. On the

other hand, if the average employee was permitted to follow job through from beginning to end and see the work which he had helped to create, completed and in operation, it is safe to assume that he would be much more interested in his work and it certainly would be a better job.

The disadvantages of the vertical method are:

1. Less standardization as the same operation is being performed by many groups.
2. Transmission lines would be located usually in more than one district. It would be advisable therefore to handle all transmission lines in one or more groups not restricted by the boundaries of the districts into which the distribution system is divided.

Having outlined the advantages and disadvantages of the two methods of organizing a Property Record Department, the next step is to compare the two methods and draw some conclusions.

Standardization of accounting records is very important, but after it has been achieved, it would seem that the job itself should receive more attention. After all, standardized methods are only a means toward an end. The end is, of course, a complete and accurate picture of the units of property as they are added to the system. The question is therefore which method will give the better picture and if the more expensive method gives the better picture, is it worth the difference?

Admitting that the vertical system will tend to develop different methods of recording the same operation, would not the loss in standardization be more than offset by the improvement in methods which would assuredly result from many groups doing the same thing and each one trying to find a better way of doing it? There is less competition in the horizontal system. The head of each group or his superior decides how his particular operation is to be recorded and no one else is interested.

Under the horizontal groupings, some one in each of the first six groups would require information about each job or order. In the majority of cases the necessary information is provided under the regular routine. In many instances, however, some one in each group requires more information about an order than is contained in the title. It might be necessary for six different people, one from each group, to find out some or all of the details about a certain job from several different sources. This presents many difficulties and takes a great deal of time. Under the vertical grouping, one man would get most of the necessary information at the start and would

(*Continued on page* 370)

Merchandising Home Lighting Equipment

THE present business situation is to some extent comparable to that of five years ago. With output and revenues lower than last year in some classes of business, one of the chief concerns of all electric utilities is (a) to find new markets for electricity (b) intensify efforts in those sales channels that require a minimum of sales expense and (c) concentrate in the widest potential market where substantial progress has definitely been proved possible.

Selling lighting the Better Light Better Sight way qualifies in all respects. Continued education of the public to the principles of Better Light Better Sight is obvious. It has been such efforts during the past five years that have made millions of people conscious of their eyes and of the need to provide proper seeing conditions to safeguard eyesight. Sales programs and promotions along educational lines unquestionably have accounted for the new public concept of adequate lighting and proper lighting—all of which has resulted in higher lighting standards and revenues.

What is needed now to supplement continued education is a concentrated drive on the sale of lighting equipment in the broadest way possible.

The action of the Sales Committee at the June Convention in passing a resolution proposing that all electric utilities expand the sale of residence lighting merchandise through every possible outlet this Fall and Winter reflects the concerted thinking of commercial executives throughout the country. A special committee was authorized to develop a program. This Special Committee composed of some fifteen successful merchandising men from all sections of the country is headed by Mr. Fred S. Dewey, Sales Manager of the Cincinnati Gas and Electric Company as Chairman.

This Committee of experienced men is well aware of the great potential market that exists for the sale of lighting equipment of all kinds. It is estimated that if it were possible to convert all the wired homes of the country to the standards of Better Light Better Sight, the sale of home lighting equipment—including bulbs—would measure more than 500,000,000 pieces. The accepted market for I.E.S. type of portable lamps alone is 100,000,000 units.

New fixtures and wall type units, filling of empty sockets and increasing sizes of bulbs to higher wattages for good lighting represents several more hundred millions of units.

Combined, these potentials indicate a market warranting the most comprehensive and thorough sales and promotional activities possible.

While those utility companies that merchandise have generally been the main outlet locally for I.E.S. Better Sight lamps, they alone can never hope to provide the necessary sales set up to cover the vast potential market for all of the new types of lighting equipment. Most companies, however, are and should continue to be the leaders in promoting I.E.S. Better Sight Lamps, Pin-It-Up lamps and correct wattage bulbs.

If home lighting equipment potential is ever to be approximated, in terms of sales, a greatly increased selling tempo is needed. Department stores representing the backbone of the country's portable lamp business are selling less than half the number of I.E.S. lamps that they should be selling.

Furniture stores, totalling more than 17,000 nationally are just getting started on I.E.S. lamps. Furniture store buyers, managers and clerks evidently need a great deal of contact and explanation.

Other prospective outlets include hardware and household appliance stores numbering some 40,000 throughout the country, many of which are selling some lighting material but the majority are not selling I.E.S. lamps and similar equipment.

The Special Lighting Committee is giving consideration to the following as objectives in the proposed coordinated program.

1. Analysis of local market possibilities. Interpretation of this to all present and possible outlets for home lighting equipment.
2. Adequate and consistent training of clerks and buyers of all retail outlets.
3. Consumer education in its various forms, exhibits, talks, demonstrations, etc.
4. Consumer advertising of a nature helpful to all sales outlets.
5. Promotion ideas which interest both buyer and seller—designed to maintain constant alertness to opportunities.
6. Local activities which tie-in with national activities, promotions and advertising.

The Committee is expected to make announcement of the first of its suggestive plans at an early date. The whole program will consist of two concentrations—one for the period, October, November and December—the second during February, March and April of next year.—C. E. G.

A Few Words on Public Utility Publicity

By Howard F. Weeks

Assistant Director, Editorial Bureau, Consolidated Edison Company of New York, Inc., and President, Public Utilities Advertising Association

ENTIRELY too much mystery has been associated with publicity and its effect on the public relations of the present day electric company. Publicity is a force which, properly directed, can do a great deal of good in creating and maintaining a favorable attitude toward the company, and yet many people in the industry fail to gain a complete understanding of its possibilities because of the sorcery and latency sometimes attributed to it.

To obscure the purpose and results of publicity with any cloak of mystery has always been ridiculous and today it borders on the dangerous. The present generation of public utility company executives and workers has witnessed at first hand the birth of a new public concept of their business. There was a time when "good service at low rates" could be expected to do a complete job, not only of business building but also of public relations. Today, however, conditions are different—and whether we like it or not, we are living in an era of changed opinions and changed reactions. Anyone who has the slightest doubt of this is urged to consider the stated purposes of some of the state and Federal laws passed within the past year or two and compare these with his own ideas and thoughts of a decade ago. There has been a marked change in the mental processes of all of us—and the customer's conception of the public utility company and the service it renders is no exception. *On the contrary!*

This is a time when proper and intelligently directed publicity will achieve results which are vital to the success of the business, and which cannot be secured in any other way. Many activities and many influences have helped to give the public this new concept of our business. It is an undisputed fact that there were some isolated instances of malpractice within the industry a few years ago, but no one can successfully say that because of these few instances the entire industry was tainted. However, one effective means of making the public believe this is for the industry to keep quiet. Secrecy—or even reluctance to talk—creates doubt and suspicion in the average mind, and if questions

MR. WEEKS

aren't answered frankly and completely, the verdict of the public is "guilty."

The purpose of these notes is not to make a plea for a concerted and extensive program of propaganda. No minds are "to be poisoned," and no high pressure tactics are to be used. What is recommended is an appreciation of the necessity for dealing with newspapers and other media reaching the public in the frankest manner possible. Tear the cloak of mystery from publicity—throw away the high-toned expressions associated with it, such as applied public psychology, moulding public opinion, etc. —and use it as an effective tool to inform the public frankly of our progress and of our problems.

Ordway Tead, of Harper & Brothers, recently said that business must get away from the idea the public is composed of "morons who can be satisfied with half-truths." Men and women today demand a wider scope of information. Proof of this lies in the fact that *news* as such is enjoying a popularity unheard of years ago. News commentators on the radio—news magazines—news picture publications—all have had phenomenal success in catering to Mr. and Mrs. John Public's craving for facts. If there are executives who doubt the desirability and value of intelligent and frank publicity, let them stop a minute and analyze their own reactions to the news and publicity of other companies and of other industries. They will find that certain stories and facts are illuminating and interesting and that they are getting an entirely different perspective of "the other fellow."

With the modern electric company, the rates are low, the service is good, and the employes are well-trained. These factors are essential to good public relations, but today they are not sufficient in themselves. Intelligent, frank publicity is needed or the public is quite likely to overlook our problems and remember only our shortcomings. The job for the electric company today is to clear the public mind—and keep it cleared. It is vital that our customers believe that the company is an honest business run by honest men and women at an honest profit. And the way to do it is to be frank and honest in all things —and to be franker than ever in dealing with the public. All questions can and should be answered completely, whether the questioner be a customer or a newspaper reporter. Recently a study was made of the nature of questions asked by newspapers over a period of several months, and the result was that virtually all of the information and data sought was on file in one or more places open for public inspection. It is impossible to keep secrets about the operation of a public utility, and thinking people must agree that the only possible method to follow is one of complete frankness.

One reason why the electric company *must have* the confidence of its public is that it has to do business in the territory it serves. A manufacturer of barrels in City X may do most of its business in City Y—and the opinion of the residents of City X does not affect the company's welfare to any great extent, just so long as City X feels favorable. But the electric company in City X needs the support of the customers in City X—and no amount of good feeling on the part of City Y's citizens will help the company solve its problems or expand its business. Mr. Utility Man has to live with his customers and his public—and it's a certainty that it is less annoying when people live together

harmoniously. The electric company is much the same as a bank in so far as the vital importance of local faith and confidence is concerned.

Legitimate and honest newspaper publicity is the keystone of the public relations effort to gain this local faith and confidence. The newspaper is one of the most important influences in the lives of our customers. The appeal of the utility should be to the ordinary people—the rank and file—and the perfect medium is the newspaper because it is directed at just that class. News is what a large share of the public wants, and it depends largely on the news columns of the newspaper for it. Advertising is different in that it stresses what the company wants to sell to the public. The function of news is to make the important interesting, and therefore publicity must have definite news value. Advertising may be more selfish, more concerned with the company point of view.

If there is a sermon in this paper, it is that the electric company should cultivate its customers and the public the same way that a man or woman cultivates a friend. Nothing less than frankness will do. Electric companies are manned by human beings, and human beings have been known to make mistakes from time to time. When these instances occur, be honest about admitting what happened. Recently an enraged customer wrote to a metropolitan newspaper outlining in detail what was considered to be a justifiable complaint. The person in charge of letters to the editor called the publicity department of the company. An investigation disclosed that two mistakes had been made by two separate departments—the rest of the grievance was without grounds. The true facts were admitted, and the response, both on the part of the newspaper and the customer, was that no one wanted to find fault with the clerks involved. Mistakes had been made—but they have been made for many years by many people. In other words, a frank answer turneth away wrath!

There is probably an excellent example of the benefits of frank publicity in the breakdown at the Hell Gate station in New York City two years ago. Here was a serious accident. A portion of Manhattan was without electricity. If all hell broke loose at Hell Gate, it also did in the publicity office. Inquiries were answered frankly. The limits of the territory involved were given out, and the papers were told exactly what was being done to restore service. Wild rumors were promptly squelched by facts. It was a case of being absolutely frank and honest. And if anyone thinks that wasn't the best policy to follow, let him imagine what would have happened if the company had not been so honest. And, of course, it would have been ridiculous to deny what actually happened. This example brings up another point—one which was touched upon recently by Mr. Luce, head of the *Time-Life-Fortune* outfit. He said it is easy to make news of the bad, the shocking, and the evil—and hard to make news out of the good. This may or may not be true, but it is not impossible to make news of the good—and certainly most of the news which develops in an electric company is good news. It is pleasant to the customer.

To maintain a proper perspective toward publicity and its results, it is necessary to bear two warnings constantly in mind:

1. Don't think that it is necessary to flood the newspapers with material. The frequency of publicity releases never has proved to be a criterion of a public relations program. Rather, it has been the excellence of the releases.

2. Don't make the fatal mistake of threatening to stop advertising if the newspaper won't publish the news releases, or "won't print the company side." Such a threat might be productive of several inches of publicity, but the net effect is that the company is making an enemy. The alternative is to turn out news which will be printed—which the newspaper will want to publish.

The utility company executive must assume that the public is intelligent and wants to be kept informed and that too much emphasis can not be given the importance of getting accurate, factual, and interesting information to this public, together with a clear indication of the source. Psychologists say that one of the most powerful of human traits is that of identification. People read of a disaster and say to themselves: "How horrible. What if I had been there, or suppose my wife and children were involved." So they are not too critical of our few mistakes—and they sympathize with us when they understand our problems. When there is good news—which is 99 per cent of the time—they are glad to know it.

Floyd L. Carlisle said recently: "There isn't anything basically wrong with the United States, and I believe the common sense of the American people will right things in due time." The electric company could do worse than depend on the common sense of the American people, and their appreciation of proper, frank and honest statements explaining the progress and the problems of the business. And that, in itself, is an intelligent publicity or public relations program!

Organization of a Property Record Department

(*Continued from page* 368)

use it as required for the correct recording of the progress of the order.

Under the vertical system, special information required about any piece of property or equipment could be promptly obtained from the group in whose territory the facilities were located. The head of each group and his first assistant would know their property intimately as a result of study and analysis of each order under which it was installed and from personal inspection and constant contact with the men who design and operate it. Under the other system, the man who issues the orders may never know if they have been carried out, the man who records the material and labor cost seldom sees the plans or the completed work, the group that takes the field inventory do not have the advantage of seeing invoices for the equipment they must describe, and the man who makes the final reports on substations, for instance, may know very little about the transmission and distribution systems which they serve and might not even know whether the company owns the land on which a particular station is built. Therefore, when information is required about property owned by the company located in a particular city or town, several groups must be consulted to find out the different kinds of equipment in operation and other groups to determine what is in course of construction and whether any additions or retirements are being contemplated.

The vertical grouping would give the head of the department an opportunity to advance the more capable employees to positions of responsibility as there would be more groups and each group would have a man in charge and an understudy.

It may be argued that the vertical system is retrogressive, that it goes back to smaller company methods and rejects the admitted economies and increased efficiency of mass production technology. But, is it logical to assume that methods which have been applied so successfully

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Past Accomplishments Should be Given Consideration in the Selection of Prime Movers for Pipe Line Stations

By W. H. Stueve

Power Sales Engineer, Oklahoma Gas and Electric Corp.

IN recent years, oil trade publications, engineering magazines, and other publications allied with the petroleum industry have published many articles relating to oil or gasoline transportation, having to do with pump station design, station floor plans, and other construction details; which articles, while they are of an informative nature and of considerable value to design engineers, overlook the most important feature affecting station design.

The subject referred to as being entirely neglected, but yet more important than all other detail, is the selection of the proper prime mover to operate the pump station the most economically.

The selection of the prime mover, whether it be oil engines or electric motors, usually erroneously resolves itself into determining the installed cost of the oil engine station and the electric motor station, and then assuming that the pump stations will operate at 100 per cent capacity throughout their entire life of three, five, ten, or twenty years, as the case may be.

It is comparatively an easy matter to compute the station operating costs in the case of the oil engine installation, knowing the line pressures required at the maximum design volume, which in turn determines the installed horsepower. The next step is to add the fixed charges, labor, fuel, lubrication and maintenance together, and the total is taken as being the annual operating costs of the engine station. These hypothetical annual costs at 100 per cent operation when converted into units of electrical energy usually result in a figure of the order of five-mills per kwhr, and rarely much greater than six-mills. In a great many instances only fuel and lubrication are considered as proper total operating charges. This method might even result in figures as low as two or three-mills per kilowatt hour when the plant is located at or near the source of supply.

Thereupon the electric station comparison is not made and the possibility of its use is discarded, for the design engineers know that power companies have never quoted rates of that low level for this class of service, and perhaps never can.

MR. STUEVE

The design engineer is usually agreeable to accept this mode of reasoning, and his decision is enhanced further in value for he realizes the executives are always eager to believe the line will operate at full (100 per cent) capacity year after year.

The truth of the matter, deduced from an examination of Interstate Commerce Commission records, from reports made by these same pipe line companies, is that capacity factors of "trunk" pipe lines average about 40 per cent annually, and further that the capacity factor of "gathering" pipe lines average only about 20 per cent annually, considering all pipe lines in the United States.

Therefore, if proper consideration is given to past accomplishments of the older pipe lines, the selection of the most economic prime mover for the proposed line should in many cases result in the installation of electric motors operated with purchased power.

A study of this scope can be made only by examining the records of power utilities serving these older pump stations, from which data, the energy sold can be determined and the volume of fluid pumped can be calculated.

The pump stations chosen for this study, to determine past accomplishments, are selected at random from the files, giving consideration to pump stations installed in main "trunk" lines, and also to pump stations installed in so-called semi-trunk lines, or "gathering" stations. The energy purchased in kilowatt hours is plotted horizontally in terms of percentage of maximum energy required to pump at maximum design capacity for each month of the years these stations have been installed. This variation in energy consumed is graphically illustrated in Figure 1, for the pipe line stations shown in Table I.

Referring to Figure 1, the energy consumed each month is graphically represented for the five typical pump stations listed in Table I, note the wide variation in energy consumed for the periods of seven to eight years.

The graphs for "A," "B," and "C," represent pump stations installed to serve a newly discovered oil field and can be termed semi-trunk line stations, or large "gathering" pump stations, while the graphs for "D" and "E" represent pump stations installed in a strictly so-called "trunk" line. The graphs in Figure 1 indicate that the variations in electric energy requirements, of the five pump stations, are apparently controlled more by market demand for the refined products and general business conditions than by the flush condition of the oil pools

TABLE I—EQUIPMENT AND CAPACITY OF PIPE LINE STATIONS STUDIED

Station Name	*Type of Equipment Installed*	*Total Capacity Bbls./Day*	*Pipe Line Diameter*	*Miles of Line Pumped Through*
"A"	1—500 H.P. to 6″x24″ Triplex	25,000	8″	30
"B"	2—200 H.P. to 5″x24″ Duplex	22,000	8″	36
"C"	1—200 H.P. to 5″x24″ Duplex	12,500	6″	29
"D"	2—300 H.P. to 6″x24″ Duplex	36,000	10″	60 and 190
"E"	2—400 H.P. to Centrifugal Pump	40,000	10″	35 and 70

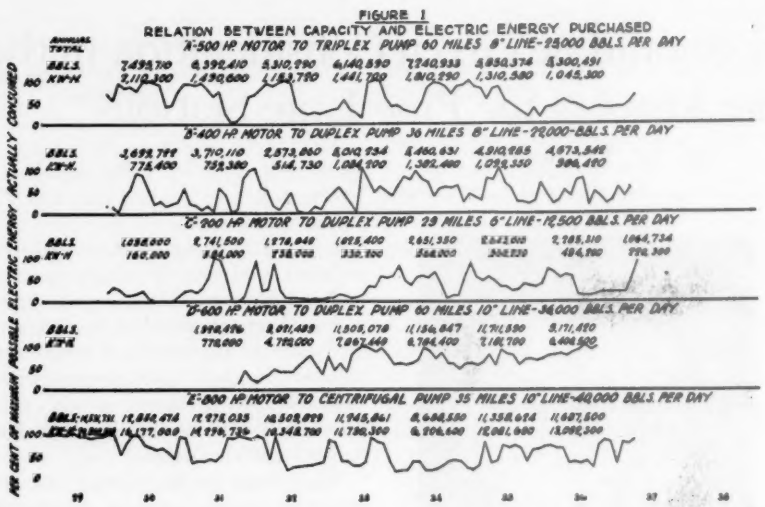
FIGURE 1
RELATION BETWEEN CAPACITY AND ELECTRIC ENERGY PURCHASED
A-500 HP MOTOR TO TRIPLEX PUMP 60 MILES 8" LINE-25000 BBLS. PER DAY
B-400 HP MOTOR TO DUPLEX PUMP 36 MILES 8" LINE-22,000-BBLS. PER DAY
C-900 HP MOTOR TO DUPLEX PUMP 29 MILES 6" LINE-12,500 BBLS. PER DAY
D-600 HP MOTOR TO DUPLEX PUMP 60 MILES 10" LINE-34,000 BBLS. PER DAY
E-800 HP MOTOR TO CENTRIFUGAL PUMP 35 MILES 10" LINE-40,000 BBLS. PER DAY
PER CENT OF MAXIMUM POSSIBLE ELECTRIC ENERGY ACTUALLY CONSUMED

Fig. 1

served by the pipe lines. This fact is noted from the variations in energy consumed even during the first few years of their installation.

The information disclosed by the graphs in Figure 1, showing the relation between the actual electric energy consumed and the maximum possible amount of electric energy which the station could take when operating at 100 per cent capacity factor and/or load factor expressed in per cent, does not necessarily mean much to the casual reader unless it is analyzed further to determine the actual amount of oil transported when a definite amount of electric energy is purchased.

These calculations have been made and the results carefully checked with the individual company owning the pump stations "A," "B," "C," "D," and "E," shown in Figure I, with the idea in view of determining the relation between the electric energy actually consumed, expressed in per cent of maximum possible takings, and the capacity factor of the line expressed in per cent of maximum possible capacity. This relation is shown in Figure 2, where per cent capacity factor is plotted horizontally, and per cent of maximum electric energy consumed is plotted vertically for the years covered in this study.

Referring to Figure 2, note that the calculations from the gathering line stations when plotted, go to make possible the curve "A," "B," and "C"; whereas, the calculations from the trunk line stations, when plotted, go to make another curve labeled "D" and "E."

The points for the curves shown in Figure 2 were developed by using annual totals of actual energy purchased and annual total of barrels of oil pumped for each calendar year, all expressed in percentage of maximum.

An equation for the curve "A," "B," and "C," in Figure 2, covering pumping performed in 6 in. and 8 in. lines, can be written somewhat as follows:

(a)—Per cent of maximum kilowatt hours consumed annually equals per cent annual capacity factor raised to 1.5 power.

Similarly an equation for curve "D" and "E," covering pumping performed in 10-in. lines, can be written somewhat as follows:

(b)—Per cent of maximum kilowatt hours consumed annually equals per cent annual capacity factor raised to 2.2 power.

These equations (a) and (b) also hold true when specific months are selected from the data given in Figure 1.

The discrepancy between the two curves shown in Figure 2 ("A," "B," and "C") and ("D" and "E") appears obvious when consideration is given to the pipe diameters of the lines studied, and the conditions under which the stations "D" and "E" can be operated. The capacity factor of a given pipe line containing two or more pump stations, as is the case with the data shown for Stations "D" and "E," can be maintained at a higher value and greater efficiency when considered on an annual basis because of the flexibility of station pumping control of volume. In the case of single stations "A," "B," and "C," pumping through comparatively short pipe lines, this rule does not hold true since the flexibility of volume control is limited, and there are no stations to be by-passed.

As stated previously, this discussion so far deals only with the amount of electric energy purchased, so in order to complete the story and make it of some value to the pipe line design engineer to be used in making predictions for the future, and to disprove the assumption usually made that all pipe lines of whatever types operate at high capacities year after year, the following Table II is developed to show the actual total amount of oil transported, in terms of capacity factor, by the pump stations listed in Figure 1 and computed from curves in Figure 2 for the total number of years the stations have been installed.

In reviewing the averages from Table II, it is of striking importance to contemplate the relatively small use that is actually made of the maximum power equipment these stations have installed, leading one to believe that in performing their pumping demands through the years, that they make economical use of purchased energy, and in keeping with good operating practices.

Up to this point, the results of the study are significant in that it is now possible for the pipe line designer to know exactly how much electric energy he will have to produce in order to pump certain given quantities of oil under the most economical conditions; and further the results show that most pipe lines do not operate at 100 per cent capacity factors over a period of years, whether the pipe line be a main "trunk" line or a "gathering" line.

One now may inquire, "What has

TABLE II—OVERALL PERCENT ELECTRIC ENERGY PURCHASED AND PERCENT CAPACITY OF PIPE LINE "A," "B," "C," "D," AND "E"

Station Designation	*Total Elapsed Time in Years*	*Average Percent of Possible Maximum Electric Requirements*	*Weighted Average Computed Percent Capacity Factor*
"A"	7½	58.4	70
"B"	7 1/3	42.8	60
"C"	7½	32.5	48
"D"	5	66.4	83
"E"	8 1/3	62.5	81

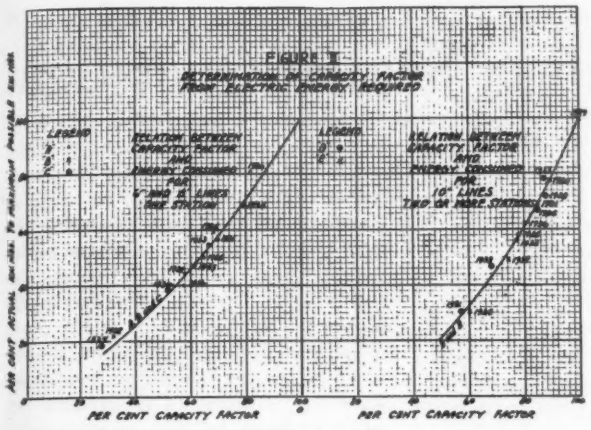
FIGURE I
DETERMINATION OF CAPACITY FACTOR FROM ELECTRIC ENERGY REQUIRED
LEGEND
EQUATION BETWEEN CAPACITY FACTOR AND ANNUAL KW HR. REQUIRED PER KW. OF MAXIMUM DAILY CAPACITY FOR 6" AND 8" LINES FROM STATION
LEGEND
EQUATION BETWEEN CAPACITY FACTOR AND ANNUAL KW HR. REQUIRED PER KW. OF MAXIMUM DAILY CAPACITY FOR 10" LINES TWO OR MORE STATIONS
PER CENT CAPACITY FACTOR
PER CENT CAPACITY FACTOR

Fig. 2

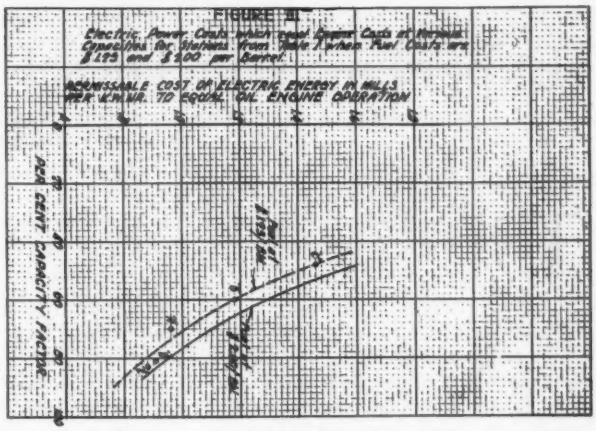
FIGURE II
ADMISSABLE COST OF ELECTRIC ENERGY IN MILLS PER K.W.HR. TO EQUAL OIL ENGINE OPERATION
PER CENT OF CAPACITY FACTOR

Fig. 3

this relation between electric power required and capacity achieved to do with pipe line design or the selection of prime mover?"

Well, it is simply this: If the station installed represents a certain investment cost, and the total horsepower capacity in the installed stations is utilized only from 32.5 per cent to 66.4 per cent (actually from Table II) of the total capacity installed over a given period of years, it might behoove the designer, in the first instance, to seek the cheapest form of prime mover and pumps commensurate with good mechanical engineering practices and thereby lower his fixed charge portion of his station operating expense.

This reduction in first cost of pump station can be accomplished, as everyone must admit, by considering electric motors as the prime mover as against considering oil or gas engines as prime movers, probably 50 per cent or one-half, when the total station investment is considered; the pumps and all other equipment installed being considered essentially of the same first cost in either type of station. If the pump station being installed is contemplated for a main trunk system, and continuity of delivery is essential, then a standby or auxiliary unit of one-half the total capacity would be deemed necessary, and in this case the electric station could be installed for about one-third or 35 per cent of the total cost of an internal combustion engine driven station.

Estimates collected from a large number of contractors indicate that the lowest cost "gathering" or semi-trunk line station, without standby units, can be installed for about $2.00 per barrel of maximum daily capacity by using electric motors; whereas, if engines are used as prime movers, the cost is about $4.00 per barrel of maximum daily capacity within the range of ordinary size pipe lines of 6 in. and 8 in. diameter. In the case of main trunk line station design, where standby units are considered, the lowest cost of electric motor driven station will cost about $1.75 per barrel of maximum daily capacity; whereas, the engine driven station, under similar circumstances, will cost about $5.25 per barrel of maximum daily capacity within the range of capacities ordinarily considered for 10 in. and 12 in. line diameters.

As previously stated, a great many operators are prone to speak of pumping costs as consisting of labor, fuel, and lubricating costs only, and they neglect entirely such pertinent costs as fixed charges on the investment. Maintenance costs rarely can be determined or properly accounted for, resulting finally in the general idea that pumping energy with oil engine stations can be produced for two to three mills (fuel only) per bhp. hour. Also, as previously stated, no consideration is given to the possibility of variations in capacity factor of the line for the present or for the future. Therefore, with executives and design engineers in this frame of mind, the consideration of use of "electric power," frankly, is cast aside because of its apparent high cost.

The question is often asked by the pipe line executive, "Why should we pay nine or ten mills per kilowatt hour for electric energy when we can produce it ourselves for two or three mills?" The answer to this question is apparent when consideration is given to the factors which are included in the electric power rate quoted.

Figure 3 based on minimum possible engine costs shows annual average per cent capacity factor plotted against cents per kilowatt hour, which the pipe line company could afford to pay for all conditions of oil transported, for values of fuel oil or crude used for fuel at $1.25 per barrel, and also for values of fuel at $2.00 per barrel. Intermediate selected values of fuel can be arrived at by interpolation to determine how much the pipe line station could afford to pay for electric energy which would permit his operating costs to equal the operating costs of engines.

In conclusion, it is suggested that designers of pipe lines should be made to study the history of accomplishments of existing lines and apply the results so obtained to their own problems at hand in making predictions for the future of the proposed pipe line.

A brief summary dicloses the following facts:

(a)—Any class of pipe line does not operate at 100% capacity over a given period of years.

(b)—Electric power purchased at 1.5 cents or 2 cents per kilowatt hour may be cheap, depending on the capacity factor achieved.

(c)—Definite relationship between capacity factor of any pipe line and the amount of electric power required at such operating capacity is established.

(d)—If the operating capacity factor of the proposed pipe line can not be predicted, let the power company provide the energy for the prime mover to replace the greater investment in engines.

The value of a study of this character, considering only oil pipe lines, may be questioned, but this method of consulting "past accomplishments" can be applied to any industrial load sought after on being solicited by power sales engineers anywhere in the country.

Experiences in Diesel Power Station Operation

By John M. Drabelle
Mechanical and Electrical Engineer

THERE is an old verity that states, "Half truths are simple, but only the whole truth is complicated." So it is in dealing with the many and numerous conflicting statements and claims of those who advocate the use of diesel engines as prime movers for power generation. The diesel engine salesman would have you believe that his product is the answer to all of the trials and tribulations relating to the economic production of power, and there are others who characterize diesel engines as no good at all. Both statements represent the extreme swings of the pendulum of engineering opinion and both are equally incorrect.

The experiences and conclusions contained in this paper embrace fourteen years of experience with diesel engine operation in Central Station Service. In this group are twelve stations with a total of thirty-one engines installed. The several power stations are operating under the following three classifications: Stand-by, peak load, and continuous. The engines operated were the product of several manufacturers in the United States and in type classification are as follows: Four-cycle air injection, four-cycle solid injection, two-cycle solid injection pump scavenged, two-cycle piston scavenged-cross head type, and two-cycle crank case scavenging solid injection.

The writer believes that the diesel engine does have a field of application. The diesel engine is not, however, in our opinion a cure-all in any sense of the word in the power production problem. Its proper field of application seems to be where water supplies are scarce and bad, coal high in price and remote from mines, loads relatively small and poor load factor.

Auxiliaries

Based on this experience of fourteen years, certain mile stones stand out clearly in the path of experience. Too much care and detailed attention in the selection of auxiliary equipment, after the prime mover is purchased cannot be given to these very important adjuncts of a diesel plant. There is a definite tendency on the part of all manufacturers to gloss and pass over the subject of auxiliaries, in an effort apparently to convey to the purchaser that these are relatively unimportant and are too often skimped in size, resulting in serious complications later on for the operating force. Adequate cooling towers, or spray ponds, adequate water cooling pumps, at least, in duplicate and preferably in triplicate should be provided for the handling of the raw water cooling supply.

Heat Exchangers

Heat exchangers for water to water service and water to oil service are in many cases too small in size. Theoretically they are of correct size, but when the inevitable slight accumulation of dirt, slime, scale and wax is deposited on the tubes in combination with the hot sultry day, the heat transfer rate is so reduced that inadequate cooling is the inevitable result, and an overheated engine results.

The best technical information on the subject of heat transfer in heat exchangers of the water to water and oil to water type will be found in a bulletin of the University of Texas No. 3128, issue of July 22, 1931, entitled "Heat Transfer in a Commercial Heat Exchanger," by B. E. Short and M. M. Heller. Apparently the ratings set up by manufacturers for such exchangers have been based on inadequate shop tests.

Water Treatment

The treatment of water used for cooling and circulating purposes in a diesel engine plant is another source of possible trouble. Practically all water contains certain scale forming impurities. It is true that the amount of temporary and permanent hardness varies with this water in different localities, but nevertheless these scale forming substances must be removed. The most satisfactory manner of doing this is by means of the zeolite type of softener wherein by means of the zeolite and a solution of common salt the calcium and magnesium constituents in the water are exchanged in the zeolite for sodium salts which are not scale forming. Due to the evaporation in the cooling pond or tower, this water loss must be continuously replaced and occasionally the concentrated solution that forms in the cooling basin must be drawn down to reduce concentration. A softening system is essential whether heat exchangers are used or not for the reason that scale in untreated water will form in the tubes of the heat exchanger unless the water is treated. The amount of water replaced by evaporation usually amounts to from one to three gallons per horsepower hour depending on wind velocities, the type of cooling system used and the humidity. Experiments have been made using various types of so-called water compounds, but in no case known to the writer have these been satisfactory in performance, and in every case the cost of these chemicals have far exceeded the cost of salt used in the zeolite type of softener. In the case of the growth of algae the use of a solution of copper sulphate is very beneficial and in aggravated cases chlorine must be used.

Cooling Towers and Ponds

There are two means of dissipating the heat in the cooling water. One is by means of the cooling tower which consists of a series of shelves over which the cooling water falls and the other is the spray pond. Both are satisfactory and in some localities the cooling tower on account of wind velocities is more satisfactory than the spray pond on account of driftage loss. Cooling the water to within 10 deg. of the dry bulb temperature means little for the reason that it is the wet bulb temperature that really determines the ability to cool. A good tower or spray pond should cool to approximately 10 deg. to 12 deg. of the wet bulb reading.

Oil Filters

Oil filters should be installed upon both the fuel oil lines and the lubricating oil lines, so as to remove from the system any dirt or other material that may be floating in the respective oil streams. Oil centrifuging equipment for removing dirt, suspended carbon, water and other material from the lubricating oil supply is a most desirable and money saving plant auxiliary as it will save quantities of lubricating oil

that in many cases as soon as fouled is thrown away.

Pyrometers

Pyrometers are absolutely necessary in order that the operator may know the load and load balance carried on each cylinder of the engine and if excess temperatures are found to properly correct the same before serious damage results.

Nozzle Testing

The solid injection fuel oil nozzles are quite critical in adjustment in all makes of engines of this type, and a fuel oil injection nozzle testing pump with its gauge is a most necessary piece of equipment in the power station in order to maintain nozzles to good spray efficiencies.

Air Filters

Due to the dust storms of recent years, particularly in the Western territory, the air filter has shown itself to be a most necessary piece of equipment in the power station. The quantity of dust carried into the working cylinders of an engine under dust storm condition will result in two things, fouling of the lubricating oil and extra wear and possibly scoring of the pistons and cylinders.

Fuel Oil

Too often the statement is made that a diesel engine can burn anything. It possibly can, but with what results in fuel consumption and engine damage is another matter. For many years all fuel oil received by our companies has been checked in a central chemical laboratory before unloading and numerous cars have, on the results of the laboratory's findings, been rejected. It is our experience that specific gravity of fuel oil means but little, viscosity, fire, flash, ash and Conradson Carbon number are now regarded as most important items. A good alert operator will often refer to an oil as good or bad and say, "Listen to it." This is really a measure by them by ear and sound of the cetane number of the fuel oil. A great deal of work on this subject has been done by Dr. R. T. Goodwin and Dr. R. B. Rendell, of the Shell Petroleum Corporation. The results of their findings have been published in the technical press.

It has been our experience over a period of some fourteen years that the diesel engine cannot burn anything, but it must have a supply of good and satisfactory fuel oil. The air injection two and four cycle engines will handle fuels of a lower general quality and grade than will the two and four cycle solid injection engines. The two-cycle solid injection engine is the most critical and more adversely affected in the output and high maintenance by poor quality fuel oil than any other type.

Operators

The statement is often made that anybody can run a diesel engine. This is doubtless true. They can run it, but how well can they run it? Experience of fourteen years seems to show that a well trained, well paid, happy, satisfied crew of men in a diesel power station is absolutely essential for high continuity of service and good operating results and low maintenance. The best diesel operators seem to be a peculiar combination of a machinist and a watch engineer. The man must be alert, must have a good ear for sounds, a quick and a clear thinker, and a very careful observer.

Plant Records

The experience of fourteen years dictates that for successful operation of a diesel power station adequate plant records are most essential. These should take the form of a daily report on the engine operation on which is recorded hourly the various temperatures, such as water inlet, and water outlet, lubricating oil, exhaust temperatures, water temperatures leaving cylinder, the readings on fuel oil meter, and the usual electrical date of voltage, amperes, and kilowatt load carried on the unit. The monthly report, of course, is a function of the Accounting Department, and for the best all-around picture of operating results, we have found that a report which shows the money expended in dollars for maintenance, superintendence and labor, fuel, water, water softener chemicals, lubricants, miscellaneous supplies, the gross generation of the station, the amount of station auxiliary power in kilowatt hours and the amount of station unaccounted for in kilowatt hours. This, combined with certain miscellaneous data consisting of the cost of fuel oil per gallon at the station, cost of lubricating oil per gallon, number of gallons of fuel, and the lubricating oil used, the net kilowatt hours per gallon of fuel oil and lubricating oil, and the station labor hours of maintenance and operation. The unit costs are expressed in cents per kilowatt hour net output. The net output is what the station has to deliver to either a factory or a power system and not the gross generation. Too often alleged statistics and alleged engineering reports of diesel projects deal only in gross generation.

Maintenance and Inspection

On the subject of diesel engine maintenance there has been more divergence of opinion and more assumptions not founded on fact than about any other subject. A rigid system of daily, weekly, monthly and yearly inspection is absolutely necessary. Particularly the annual inspection should be of the tear down type including a check of cylinders or liner wear with micrometers and the alignment of the crank shaft by means of a strain gauge of the dial indicating type such as is recommended by the Hartford Steam Boiler Inspection and Insurance Company. There are several predominantly weak places in practically all diesel engines. The cylinder head problem is far from being solved. Lack of proper water circulation due to lack of high water velocities so as to rapidly remove heat seems to be the prevailing design fault, with resulting hot spots created, the inevitable scale deposit, however slight, results in distortion and ultimate cylinder head cracking. The wrist pin has probably received more attention from the designers than about any other part except the crank shaft, and numerous designs of pins and bushings, solid and floating pins and solid floating bushings and needle bearings are being tried out by various manufacturers. Owing to the unfavorable location of the wrist pin in a very hot position in the truck type piston it is an extremely difficult problem to solve and as far as we know no satisfactory solution has actually been made.

In the annual inspection the condition of all bearings, main and connecting rod, wrist pin, cam shaft, and everywhere else on the engine should be thoroughly and carefully checked. In reference to maintenance costs, it is quite true that when an engine is brand-new and operated during the first one or two years of its life little maintenance will be experienced, but there is a definite cycle of maintenance costs in engine life. Experience seems to dictate that this cycle varies between four to six years, that there will be a low level of maintenance for approximately two to four years after a unit is placed in operation and then on the fourth to sixth year there will be a heavy maintenance expenditure for such new parts as new cylinders, liners, pistons, wrist pin bearings, crank rod bearings, piston

rings, and other items which are subject to stress, friction and temperature.

Silencing, Noise, and Smoke

It is not uncommon for people residing in the neighborhood of a diesel power station to complain of noise, smoke, vibration and odor. The problem of exhaust noise and air intake noise can be readily solved by the use of proper silencing equipment. In some extreme cases wave traps have been used to break up the low frequency waves that are below the range of audibility but do seriously affect the shaking of windows and doors in homes and buildings adjacent to the power station. The ordinary conventional cast iron muffler pots are inadequate to properly silence an engine exhaust. The low frequency noise of air compressors, either of the scavenging type or supplying air for air injection system, or both, are serious offenders and require special treatment with special apparatus by those familiar and conversant with this most difficult acoustical problem. In respect to vibration this can usually be taken care of by isolating the engine foundation from the power station building proper, both the basement and the operating floor and by the use of various type of cork or other dampening materials transmitted vibration can be reduced to a very low value. In regard to the smoke, this largely occurs in the starting up period, although a careless operator permitting the fuel injection system to become out of adjustment or the engine overloaded will result in quantities of objectionable smoke and odor.

Engine Speeds

There is a very definite tendency on the part of all diesel engine designers to push up rotative and piston speeds to the highest permissible limits. It is our observation that the higher the speed the higher the annual average maintenance charges. There is not very exact ratio, but we have noted a very definite trend in this respect when comparing 200, 225, and 257 r.p.m. units operating in various stations.

Ratings

There is a very definite tendency on the part of some manufacturers to rate their units for all the horsepower they possibly can deliver to the engine coupling, not under field but under shop conditions with admittedly a higher standard of operators than are obtainable in a power station; furthermore, the fuel is too often hand picked and, of course, the engine is new.

Fuel Oil Prices

Owing to the extension of cracking processes in refineries, these two things are taking place. First, there is less fuel oil available for diesel engines, and second, it is becoming of inferior quality unless a premium price is paid. The steadily rising price of crude oil due to curtailed production in various states based on allotment to oil fields, means but one thing. A higher price on crude and a higher price for the refined fuel oil itself. Fuel oils in our territory have varied from a low in 1932 of 3.5 cents when the depression was at its worst, to a present average cost of about 5.7 cents per gallon. As the diesel engine has a rather fixed fuel rate for each load and each condition of load factor which is practically beyond the control of the operator, the cost of fuel oil per net kilowatt hour is necessarily a rising figure due to the advancing price of fuel.

Taxes on Diesel Fuel Oil

The April issue of *Diesel Power and Diesel Transportation* carries with it a resume of the tax situation in respect to diesel fuels. In these days when both the Federal and State Governments are hard pressed for every penny of tax that can be raised and particularly when petroleum products of every type and kind have felt the heavy hand of the taxeater, diesel fuel is looked at with longing eyes as a source of additional revenue. This tax situation, of course, divides itself into several parts: tax on diesel fuels for stationary prime movers in power plants; tax on fuels used in diesel trucks; tax on fuels used in diesel locomotives for railway service; and tax on diesel fuels used for highway and farm tractors.

The cost of diesel fuel in the localities in which we are operating diesel engines has risen from a low from about 3c. a gallon, when the depression was at its worst, to an average price today of 5.7c. If a tax of from 1c. upward to probably 3c. per gallon were added, this would mean that fuel oil would cost from 7c. to 9c. per gallon. As there is approximately ten net kilowatt hours in a gallon of fuel oil, this would mean a fuel cost per net kilowatt hour of from 7 to 9 mills. Those considering diesel engines as a source of power production in stationary units must not overlook the needs of the taxeater, and the chances are that they will probably be victims of his activities.

Standards Principles

(*Continued from page 354*)

this process the doctrine of strict, literal conformity is a great help. This situation, although it is perhaps quite natural and to a certain extent unavoidable, has led to many real abuses of the legitimate function of standards. The remedy is quite simple, it consists merely of a common-sense interpretation of what the standard is trying to accomplish and acting accordingly, but this is nearly the exact reverse of literal conformity.

In view of the situation described above, the electric light industry has urged another principle to apply in the drafting of standards generally, namely: The requirements of a standard should be stated in the most general terms practicable for the situation, and shall be based upon the result to be accomplished rather than detailed means for accomplishment. It may be observed that after centuries of experience this has become the preferred method for successful public legislation. Sumptuary laws were fashionable long ago when the King could do no wrong, but seasoned experience has shown that they did more harm than good however worthy the purpose may have been.

These few principles for standards making have been selected and set forth in some detail for the reason that they are the points upon which the electric light industry most frequently finds itself in disagreement with its collaborators in standardization matters. Aside from their technical significance to those actively engaged in the formulation of standards, they may have some interest to the general reader, first, because they may reveal that even this small department of industrial activity has its problems and these problems have a curious likeness to those in larger fields. Also, these notes may reveal that standardization programs in general have capacity for producing substantial economic effects beyond their reputed range.

Many of the features discussed may also exist in other activities than the preparation of standards. On the whole they present a case for tolerance and democracy and the skillful resolution of interests that may often be inherently conflicting. There is no special magic in the principles that are stated, they are merely the result of observation and experience through some years of effort to devise standards that will accomplish some definite good while harming no one in the process.

Notes on Advertising and Other Aids to Utility Industrial Sales

By J. H. Coates
Ebasco Services, Incorporated

THE objective of Advertising of Industrial Service is the same as that of all other utility Advertising—to enhance the customer's appreciation of the Value and Cheapness of that Service and thus to encourage its fuller Use, both as a source of profit and as a sales tool in the customer's own Industrial operations.

Sell the advantages and savings of Electric Service. In particular it is suggested that utility Industrial Sales Promotion and Advertising stress the Collateral Advantages and Savings resulting from the Use of purchased Electric Industrial Services. Wherever possible, such savings should be evaluated and dramatized in dollar terms, thus aiding in the task, now faced by practically all utility Industrial Sales forces, of encouraging customers to abandon the false idea that such Collateral Advantages and Savings are intangible—when, as a matter of fact, they are not intangible, but are really the chief economic justification for the almost universal use of purchased Utility Services by industries.

Properly designed and fully-used advertising of the Collateral Advantages of Utility Industrial Services performs two important additional functions. In the first place, it keeps all members of the customer's organization who will have an influence on ultimate decisions to use or not to use more utility Industrial Services well informed and up-to-date on the Collateral Advantages of such Services. This applies particularly to members of the board of directors, treasurers, secretaries, and other accounting officers whom the Industrial salesman seldom sees due to lack of constructive reasons for calling. The favorable opinions of such men are important and it is, therefore, imperative that high class sustained Selling and Re-selling be accomplished through the medium of printed Salesmanship.

Keep Your Employees Sold

Such Advertising has similar importance in keeping all of the utility's own employees equally well informed, up-to-date and Sold on the Value and Cheapness to customers of utility Industrial Services. It is, therefore, definitely worth the time and attention of all members of the utility's Industrial Sales staff to be sure that all utility employees—especially District Managers and others who have personal contact with Industrial customers regularly—are kept fully informed at all times of their company's Industrial Sales Promotion and Advertising program and that they receive personal copies of mailing pieces, advertisements, blotters, or other literature addressed or sent to Industrial customers.

MR. COATES

Most of all, however, it is essential that utility Industrial Advertising be designed to reach and Sell those particular members of Industrial customers' organizations who have a controlling voice in the purchase and use of utility Industrial Services.

Industrial customers, even the most friendly, need to be constantly reminded of the benefits to them of their purchased Utility Service—of its Flexibility, Convenience, Adaptability, Cheapness, and all of the other features which made them decide to buy it in the first place. Printed, as well as Personal Salesmanship is necessary to do this job thoroughly!

Power Pictorials

Many utility companies use some form of power pictorial or news magazine. Some are produced locally and others are syndicated. In either event they offer opportunities for dramatizing the sales story. Editorial comment in power pictorials may be dramatically set up and forcefully worded to tell the story of "Purchased Power in Your Business." If they contain the utility company's advertising, those ads should be made as dramatic as possible. Whether they do or do not, the illustrations and news items in such pictorials may be used to build the sales story around, as a visualizer. Each issue should be carefully scanned by the Power Salesman for its particular item which will interest each customer and after it has served as the salesman's "door opener" and perhaps his "theme song," it will serve as his silent salesman after he has left.

Selling the Salesmen

One of the advantages of Utility Service that lends itself to dramatic presentation is the assistance to the customer rendered by the Power Salesman. The next example of utility advertising covers presentation of that advantage in a dramatic manner. It is headed, "Specialists in Power Problems." Around the edges are pictures of the Power Salesmen and the text points out that "These Specialists are trained to help you increase profits through the efficient use of electric service. Their experience embraces all kinds of Industrial installations, large and small. Their services are yours for the asking. Their engineering knowledge represents one of the many advantages of purchased electric service."

Power Cost vs. Total Production Cost

Many Industrial salesmen are faced with the problem of selling the economy of Utility Service. One utility's answer to this problem is to show the Industrial customer how little of his total production dollar is spent for Utility Service. This is done dramatically by means of a visualizer made in the form of a circular slide rule. The scale around the outer

edge lists the various industries and the inner, or movable portion, has several scales such as raw materials, labor, overhead, fuel and electric service. By turning the window in the inner scale to any industry there is immediately shown the portion of the production dollar spent for each of these items, and hence their relative percentage of cost. The use of this gadget has been found very effective.

Cheery Caricatures

Many utility companies have used some character, either of local origin or syndicated, to symbolize their service. These little characters have been shown popping out of range ovens, snapping on lights, and easing household drudgery in many other ways, but surely not enough has been done with them in dramatizing Commercial and Industrial Advertising. It is surely not difficult to visualize one of these little fellows dramatizing each of the collateral values of Utility Service. Perhaps he could have 35 or more little sons, each one named for one of these characteristics of our service that mean so much to our customers. Surely, in these times, it would be far better to have our customers think of our service in terms of a cheery little character than in terms of some vicious caricature.

Blotters, Bill Stuffers, Films, Etc.

The opportunities for dramatizing the collateral values of our service on blotters, bill stuffers, and other direct-by-mail material are limitless. In addition, many of the manufacturers of electrical equipment are providing material for the use of utility companies. Recently slide films have been prepared by a utility and successfully used in both competitive power negotiations and in territorial development work.

Sales Tools and Aids

Sales tools and Sales aids are necessary for adequate Sales Presentations. The objective of Salesmanship is Sales. To secure Sales, customer action is necessary. To obtain customer action a convincing Sales Presentation is the determining influence, unless Selling is merely to be limited to order taking from customers who desire to Use more Service, and the action therefore is essentially voluntary.

Convincing Sales Presentations do not happen by accident. They are caused.

To build a persuasive, effective Sales Presentation which will develop and secure authentic New Business—as distinct from the great volume of Gravity Business which has commonly comprised, at least in a considerable portion, the "Sales Results" in many Industrial Sales Reports in earlier days—Industrial salesmen must first be provided with, and second, trained to use, the same type of Sales Aids and Sales Tools which have become the foundation upon which successful Sales Presentations are built in all lines of business—including many of the utility Industrial salesman's most aggressive direct competitors.

The place of Sales Tools and Sales Aids in modernized Selling is well described in the following quotation from the Remington Rand booklet, "Making the Public Utility Sales Program Constructive and Successful":

"In addition to developing an effective Sales Presentation, it is also necessary to provide the salesman with the necessary facilities for illustrating and dramatizing the story in an effective manner. It is very difficult to convey the proper impression entirely through a verbal description.

"The essence of good salesmanship is drama, and the essence of drama is action. The usual tendency in selling is toward the static rather than the dynamic. Recognizing these facts, the use of a sales talk by means of pictures, colored illustrations, charts, and other plans, gives the salesman's most static presentation the breath of dramatic interest.

"The salesman who works without such a portfolio must substitute words for the pictures that others show. Most salesmen fall down badly by telling the sales story monotonously, lifelessly—without any realization of the necessary peaks and valleys. The result is a dreary and ineffective interview which soon loses a prospect's attention and rarely, if ever, makes a sale.

"An outcome of this kind is less frequent when visual presentations are used. The element of drama is no longer dependent upon a choice of words. It is also important that the condition and appearance of the sales material be so protected and preserved that it will be truly representative of the company.

"It is first necessary to secure attention. Second, it is necessary to build up an accumulative effect by carrying interest from point to point. Third, it is necessary to dramatize by action pictures and interesting contrasts. Fourth, it is necessary to spotlight the important sales points. Fifth, the entire sales talk must be summarized. Sixth, the final sales step must be to secure a favorable customer acceptance and decision to buy."

A few of the more important types of Sales Tools which can be most directly useful in Industrial Sales operations are:

- Industrial Salesman's Handbook.
- Testimonial Letters from Industrial Customers.
- Survey Forms to get Thorough, Systematic Sales Data.
- Check Charts for Analyzing Industrial Operations.
- Flow Charts of specific Industrial Processes, indicating Utility Industrial Service Application at every stage of the processes.
- Articles from Industrial Trade Publications.
- Sight Meters.
- Lighting, or Other Demonstrating Equipment.
- Model Outlines for Sales Proposals and Presentations.
- Visualizers for Describing Industrial Service Applications.

They Must Be Used

The mere possession of Sales Tools, of course, does not provide the entire answer, any more than the purchase of a set of surgical instruments by an untrained layman makes a surgeon of him. Sales Tools and Sales Aids, to be effective in the hands of utility Industrial salesmen, must be:

Appropriately Designed.
Fully Understood.
Skillfully and Habitually Used.

Such Sales Aids and such skill in their use come only from training and practice. Having a positive program and procedure so that all Industrial salesmen receive such necessary training systematically and acquire skill in use of Sales Tools, are among the most constructive functions which the Industrial Sales Manager can assume.

The written Sales Presentation represents a "Package Sale" and as such should be considered in the same manner as a package product. The opportunities to make the package and its contents attractive are limited only by the imagination and the dictates of good taste, but the important thing is to make it a well-thought-out array of sales points which the salesman is trying to sell. The dramatization of these points will consist of clearly understandable photographs, charts and diagrams illustrating the points to be made; and, most important, accurate evaluations and impressive presentations of the advantages and savings of Utility Service.

Ideas from Other Industries

The advertising and sales promotion of other industries should serve as a source of new ideas. Sales promotion and advertising methods that are based on the modern psychology of selling and which are soundly grounded in understanding of human nature may be used as models to sell any product or service.

Other industries are advertising "Value of Service." Toothpaste and lubri-

cating oil, hair tonics and boilers are now sold on the basis of the services they render and not on the basis of price or ingredients that go to make up the product itself. Now more than ever before, Product Manufacturers are advertising Service. For example:

Oil Companies advertise the services of their lubrication representatives.

Pipe Fittings Manufacturers advertise the quality of the service rendered by their specialists.

Rubber Companies advertise the services rendered by their laboratories in solving the problems of industry.

Electrical Control Manufacturers advertise savings in time, trouble and expense.

Manufacturers of heating equipment advertising savings made with their equipment.

Electrical Equipment Manufacturers advertise the services rendered by their engineers.

Insulation Manufacturers advertise savings with minimum investment.

Every trade journal is full of such advertising and utility Industrial Advertising might well be patterned along similar lines. Perhaps the two most important features to be noted in these advertisements are:

1—The Emphasis on Service.

2—The Aim at Executive Attention.

It is suggested that definite responsibility be assigned to endeavor to watch specificed trade magazines and other articles and advertising of Industrial operations as sources of new Utility Industrial Sales Ideas.

Such sources are tremendously valuable. In particular, attention might well be given to the effective way industrialists are now advertising the collateral advantages and savings inherent in their specific products or services. Particularly in the case of large Industrial negotiations the alert power salesman may find advertisements run by the very industrialist with whom he is negotiating that might materially aid in clarification of his thoughts as to just what value such industrialist might assign to collateral advantages and savings.

Aim Advertising at the Man Who Has the Say

Advertising should be aimed at the man who has the say. Utility Industrial Advertising, like any other form of advertising, must reach the man who has the say, to be effective. As pointed out in a recent advertisement by *Business Week* stressing the acceptance of that magazine by executives, it is pointed out:

"Business buying is seldom a one man job—usually it involves a number of factors. A subordinate may suggest a purchase—he is important. Others may add their recommendations—and they become buying factors. But in every purchase there is a third man, or a third group, that is all-important. They are the influential executives on whose decision every sale hangs. These key executives are a separate sales problem."

In dramatizing the above quotation, *Business Week* pictures three doors on which appropriate captions are displayed:

Door No. 1—He Suggests.

Door No. 2—He Approves.

Door No. 3—He Decides.

Without deprecating the need for having the approval of all in any sales negotiation, nevertheless it is basic that the "No. 3 man" be reached with adequate utility Industrial Advertising.

A careful scrutiny of the advertising and sales promotion of other industries will yield two dividends: It will yield ideas for effective Utility dramatization; and secondly, it will often yield facts about your Industrial customers that will assist in the sale of Utility Service to them.

Dramatizing Values and Savings Pay

Dramatizing the advantages of utility Industrial Service, if done adequately and skilfully, can be depended upon not only in increased Industrial revenue but also in securing wide understanding, among both Industrial customers and the public at large, of the true Value of that Service. The latter objective is desirable both in itself and also as a specific offset to the flood of competitive advertising which is constantly being placed before Industrial customers.

Insofar as dramatization of these savings and values assists in the sale of utility Industrial Service at its true value, the utility is assured of Industrial business at compensatory rates. By the same token, such salesmanship on the part of the utility assures the customers of fair rates for every type of service, in that no classification of customers is charged excessive amounts to make up for low charges in others forced down by lack of appreciation of value received.

If dramatization of values will gain appreciation and full recognition of those values and if such recognition will keep the Service sold, dramatization should be the keynote to modern utility Industrial selling.

Organization of a Property Record Department

(*Continued from page* 370)

to factory operation can be used in a department, the chief function of which is not production but a history of production?

It is difficult to compare the cost of the two forms of organization of the Property Record Department. With the vertical system, there would be more groups, fewer people in each, and consequently closer supervision. A better knowledge of the work being done should facilitate its recording. Fewer mistakes would be made which would avoid costly corrections and unfavorable criticisms. These advantages in the vertical system should offset the mass production, lower cost claims of the horizontal organization, and it should be borne in mind that this claim is usually based on piece-work. The accountant or engineer has no such incentive.

After considering all the advantages and disadvantages of the two forms of organization, the writer is of the opinion that the horizontal method is preferable during the expansion period, but, after the properties are well established, a much better Property Record could be maintained under the vertical system and at a lower cost.

Water Heater Papers Available

TWO papers on the Advisability of Competitive Water Heater Rate and Advantage of the Water Heater Load, each of which was awarded five hundred dollars by the Electric Water Heater Section of The Modern Kitchen Bureau, have been published in book form, the Bureau announces. The papers are the work of E. A. Brand, Buffalo, Niagara and Eastern Power Corporation, and C. M. Turner, Ebasco Services, Inc.

Mr. Brand and Mr. Turner submitted their papers in a contest sponsored by the Bureau and open to executives and engineers of electric utility companies.

The two papers are bound together in a 56-page book, with heavy board covers and spiral binding, which is available on application to The Modern Kitchen Bureau, 420 Lexington Ave., New York, N. Y., at 50 cents a copy.

Electric Range Design Requirements

Final Report of the EEI-NEMA Joint Committee on Electric Range Engineering Details Affecting the Service Requirements of Electricity Supply Companies

THIS joint committee was first formed in 1932 with the aim of bringing together the electric range manufacturer and the electricity supply company viewpoints in an endeavor to solve those problems of range design relating to characteristics and facilities affecting the service requirements of electricity supply companies as distinguished from merchandise requirements. The subjects discussed have had chiefly to do with the voltage ratings of range heating elements, the characteristics of heating elements as related to operating voltages and voltage ratings, the connection of heating elements as affecting the balance of load produced in a 3-wire supply circuit, the interchangeability of use of electric ranges on 3-wire circuits derived from 3-wire, single phase, and from 4-wire, 3-phase systems, and details of construction affecting accessibility for service and repairs in the field.

In the six years that the committee has functioned, much progress has been made. Mutual understanding of the problems of the manufacturers and of the supply companies has been furthered and both groups have profited by the increased familiarity with the other's problem.

Certain desirable requirements which have to do with the scope of this joint committee have been incorporated by the Underwriters' Laboratories in the 5th edition of their Standard for Domestic Electric Ranges, dated June, 1936. To avoid duplication the joint committee is not including in this report such items as have been included in the Underwriters' Laboratories' standard.

In the accompanying Appendix are suggested standards of rating, performance, and service facilities for domestic electric ranges which the joint committee recommends for adoption.

The explanatory notes following some of these suggested standards are not a part of the standard but are added thereto to give additional background and to show more clearly the significance of the suggested requirement.

In addition to these recommended standards which have been agreed upon, the joint committee recommends that the following provisions be considered for standardization in the future.

A. It is desirable that a uniform system of color-coding of range wiring be adopted. The NEMA is taking steps to analyze this problem and bring forth a suggested uniform color-coding system.

B. It is desirable that the general location of range terminal blocks be made uniform. This desirability is recognized by everyone but is complicated by requirements of local authorities in various parts of the country. It is generally agreed that a range terminal block location at the back near the floor and near the center of the range is desirable and that attachment from this terminal block to the user's house wiring is most desirably accomplished by means of a flexible cord and plug arrangement, the receptacle for the plug being located close to the floor. Progress in standardization can only be made as adverse requirements by local authorities are modified.

C. It is desirable that facilities for leveling be provided.

D. It is desirable that the openings for surface elements of somewhat similar rating and that the elements themselves be of such dimensions that substitutions and replacements are facilitated. A survey is being made of this situation by NEMA but no recommendations are as yet forthcoming.

* * *

With the adoption of this report the joint committee as constituted in 1932 will cease to exist and its work will be taken over by a joint committee organized in 1937 having the title "EEI-NEMA Joint Committee on Standards for Electric Ranges" and with a scope of activity considerably larger than was assigned the 1932 committee. Mr. C. P. Keenan, of the Detroit Edison Company, is the chairman of the EEI Group, and Mr. Frank Thornton, Jr., is chairman of the NEMA Group on this new joint committee. It is expected that they will continue consideration of the subjects mentioned above.

Frank Thornton, Jr.,
Chairman, NEMA Group,
EEI-NEMA Joint Committee.
J. H. Foote,
EEI Representative,
EEI-NEMA Joint Committee.

March 7, 1938.

APPENDIX

STANDARDS OF RATING, PERFORMANCE AND SERVICE FACILITIES FOR DOMESTIC ELECTRIC RANGES

1. Standard Voltage Ratings of Range Elements

	Element Connection		
	Outside Wire to Neutral	Between Outside Wires	Between Outside Wires-Network
1.1 Preferred Standard Rating			
Element Nameplate Rating	115–120 v	230–240 v	199–208 v
Design Voltage	118 v	236 v	208 v
Maximum Operating Voltage	124 v	248 v	219 v

A nationwide survey of actual operating voltages of electric range elements indicates that this preferred standard rating will fulfill the requirements of the great majority of electricity supply systems. Modern high speed heating elements should not be subjected to voltages above the maximum operating voltage rating. Older types of slow speed, low temperature elements in the past have been over voltaged in many applications, making it desirable to call attention to the maximum operating voltage ratings given herein.

1.2 Optional High Voltage Rating			
Element Nameplate Rating	125 v	250 v	220 v
Design Voltage	123 v	246 v	220 v
Maximum Operating Voltage	129 v	258 v	232 v

The optional high voltage rating is designed for those supply systems employing 125 volt lamps or for situations where the voltage at the range terminals is customarily above 122 volts.

1.3 Optional Low Voltage Rating			
Element Nameplate Rating	110 v	220 v	—
Design Voltage	110 v	220 v	—
Maximum Operating Voltage	116 v	232 v	—

The optional low voltage rating is designed for those supply systems employing 110 volt lamps or for situations where the voltage at the range terminals is customarily below 112 volts.

(*Continued on next page*)

2. Performance Ratings of Elements and Devices

2.1 The wattage rating of an element shall be the wattage taken by the element when operating hot at its design voltage rating. A tolerance of plus or minus 5 per cent in the actual wattage of elements tested shall be allowable.

2.2 The operating temperature which should normally give reasonable element life shall not be exceeded when the element is operated continuously at the maximum operating voltage indicated above as applying to its voltage rating.

2.3 Relays and timing devices shall satisfactorily initiate and maintain their designed functions at 90 volts and shall not be injured by continuous operation at 130 volts.

2.4 Indicating lamps, if used, shall be of the long life type, sacrificing luminous efficiency if necessary to obtain this characteristic.

By long life is meant a life corresponding to many years of service under cooking schedules usually to be expected in domestic service. It is suggested that lamps which have a normal voltage rating of 15 per cent above that of the circuit to which they are connected should have adequately long life under the voltage conditions contemplated in these standards.

3. Adaptation to Supply Circuits

3.1 Ranges not specifically ordered otherwise shall be designed for connection to the two outer wires and to the neutral of a three-wire single-phase system supply.

3.2 Every heating element of more than 1000 watts rating shall be connected to both outer wires when in the maximum (high) heat connection.

This is designed to relieve the neutral of the supply of as much current as possible.

3.3 Heating elements of 1000 watts or less rating may be connected to the neutral and one outer wire.

This is to allow the use of more rugged construction of heating elements and to foster connections providing for low and simmering heats.

3.4 "Medium" and "Low" heat connections, elements connected between neutral and outside wires, and appliance outlets shall all be distributed between the two outside wires and the neutral so that the current due to unbalance flowing in the neutral wire supplying the range will be kept to the lowest practicable value during all cooking schedules usually to be expected.

This is designed to promote good balance under partial as well as full use of the heating elements and to minimize the voltage drop in the supply circuit.

3.5 Certain electricity supply companies require that ranges be adapted for connection to the neutral and two phase wires of a three-phase four-wire system, usually rated at 120/208 volts. Since the demand for completely interchangeable ranges is increasing, it is desirable that range manufacturers work toward the supplying of ranges which may be operated without alteration from either a three-wire single phase supply or from two phase wires and the neutral of a four-wire three-phase supply.

No specific solution to this requirement is indicated herein as the feasibility of interchangeable operation depends on many considerations of element design and control. It is suggested that where elements are controlled by 3-heat load balancing types of switches interchangeability may be accomplished by connecting the midpoint of the heating element to the neutral wire when switched to the high heat connection. Many methods of control do not provide for this feature, which may be incompatible with other desirable control characteristics.

4. Safety and Service Facilities

4.11 A removable jumper shall be provided for connecting the service neutral stud in the outlet connection box to the frame of the range.

The requirement that the jumper be removable is to provide for compliance with rulings of those local authorities who do not allow this connection.

4.12 Fuses installed on the range for the protection of appliance outlets, auxiliaries, or conrtol devices shall be placed in locations easily accessible without moving the range.

It is desirable that fuses be so arranged that replacement by the customer is facilitated.

4.13 A range nameplate giving adequate rating and identifying information shall be installed in a convenient location readable from the front of the range. It shall be so mounted that fumes and dust will impair its legibility as little as possible. Typical voltage designations to be shown on the range nameplate are as follows:

Element Voltage Rating	Type of System	Range Nameplate Designation
Preferred Standard	1 phase, 3 wire	115/230–120/240 v, 3 w.
" "	3 phase network	120/208 v, 3 ph. net
" "	Interchangeable	115/230–120/240 v, 3 w, or 3 ph. net
" "	2 wire	115/120 v, 2 w.
Optional High Voltage	1 phase, 3 wire	125/250 v, 3 w.
" " "	3 phase network	125/217 v, 3 ph. net
" " "	Interchangeable	125/250 v, 3 w. or 3 ph. net
" " "	2 wire	125 v, 2 w.
Optional Low Voltage	1 phase, 3 wire	110/220 v, 3 w.
" " "	2 wire	110 v, 2 w.

4.14 Each element shall be permanently marked with a plate or stamping which use will not efface, showing its wattage, voltage rating and identifications.

4.15 In so far as is practicable, ranges which may not be easily moved after installation shall be so designed that replacement and servicing of elements or auxiliaries may be made from the front and top without moving the range out of place.

This provision is of a special significance for those ranges designed to be built in place or forming a part of a unit kitchen installation.

4.16 Wiring diagrams of the range circuit and instructions for installation shall be furnished with every range.

EDITOR'S NOTE: *Reprints of this Report are available.*

New Joint Range Committee

THE accompanying article gives the results of the work of an EEI-NEMA Joint Committee on standardization of certain engineering features of the electric range.

At the present time a joint committee on Standards for Electric Ranges, formed at the request of the National Electrical Manufacturers Association, is working on the preparation of a test specification for household electric ranges. This new joint committee has a broad scope and is planning to deal with many of the mutual problems relating to the manufacture, distribution and servicing of the household electric ranges. The members of the committee are:

Edison Electric Institute

C. P. Keenan, Chairman ..... The Detroit Edison Co.
R. H. Bloedorn .. Consolidated Gas, Elec. Lt. & Pwr. Co.
J. H. Foote ..... Commonwealth & Southern Corp.
A. C. McMicken .. Portland General Elec. Co.
Alt.—
J. O'R. Coleman .. Edison Electric Institute

National Electrical Manufacturers Association

Frank Thornton, Jr., Chrmn. ... Westinghouse Elec. & Mfg. Co.
H. H. Hubbard .. Electromaster Co.
F. H. McCormick . Frigidaire Corp.
W. F. Ogden ..... Edison G. E. Appliance Co., Inc.
Alt.—
W. J. Russell .... Westinghouse Elec. & Mfg. Co.

Inductive Coordination Aspects of Shunt Capacitor Installations

THERE has been a substantial increase in the use of shunt capacitors on primary distribution systems in the last few years. These capacitors have been applied largely to 2300/4000 volt circuits in urban areas, although there have been a few applications in the 6900/12,000 volt class. In 1937 a total of about 100,000 kva of capacitors were installed. This extensive use of shunt capacitors on primary distribution circuits has caused, in a few instances, problems of noise coordination with communication circuits paralleling the primary circuits. The situation is being carefully studied by the Joint Subcommittee on Development and Research of the Edison Electric Institute and Bell System.

There are many factors involved in the coordination problem presented by this new application. However, a preliminary study of the information available indicates certain helpful factors and it appears desirable to make available this information pending the completion of the detailed study. The situations so far studied have involved exposures between overhead power circuits and telephone facilities, including both joint use and roadway separation. In some of these cases noise increases were experienced on open-wire toll or subscriber circuits, in others on party-line subscriber circuits in aerial cable, while others involved both toll and subscriber circuits.

Although some of the factors are applicable to rural areas there are certain substantial and important differences. Therefore, this article deals primarily with the urban situation.

Capacitors, unlike machines or transformers, are not in themselves sources of harmonics. However, the addition of a capacitor to a circuit will have important effects on the circuit impedances. If sources of harmonics exist in the circuit, then the change in circuit impedance caused by the addition of the capacitor may substantially increase or decrease the harmonic current flowing in the various parts of the circuit. This depends upon the relation of the impedance of the capacitor to the impedance of the remainder of the circuit and upon their relation to the particular harmonic frequencies present.

The effect of capacitors on the inductive coordination problem is of importance primarily as they tend to avoid or to approach a resonant condition at certain harmonic frequencies. Such a resonant condition, if it exists, usually occurs between the capacitive reactance of the capacitor and the inductive reactance of the line, regulator, and source of supply. If the capacitors are delta-connected 3-phase banks on symmetrical systems, the effects are confined to the balanced components. If the capacitors are wye connected with a neutral point interconnected with the circuit neutral, resonant effects may occur both for balanced and residual components.

The elements of the coordination problem with capacitors may be illustrated by means of a simple series circuit as shown in Fig. 1. The calculated impedances of this circuit over the frequency range for both the balanced or positive sequence circuit and for the residual circuit are plotted in this figure. Three sets of curves are shown which

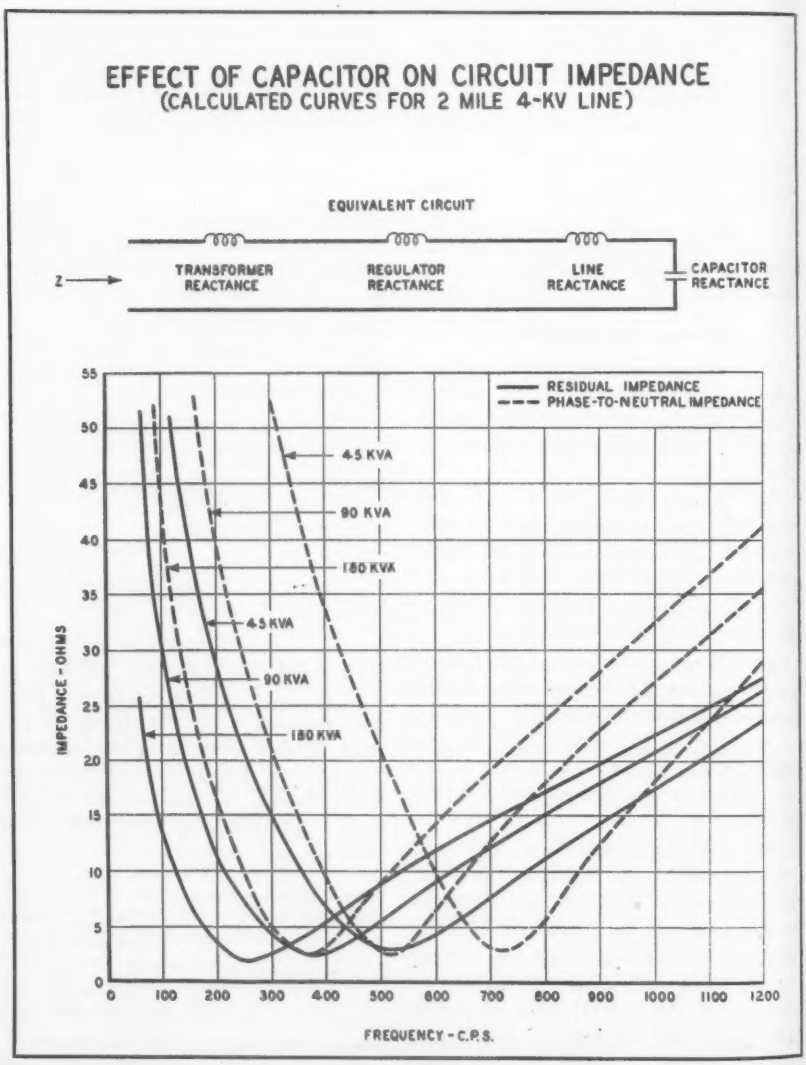

Fig. 1

indicate the effects of capacitor sizes of 45, 90 and 180 kva respectively.

When the generated harmonic in the source is at or close to the resonant frequency of the circuit with the capacitor connected, there will be an increase in the harmonic current in the circuit and in the harmonic voltage drop across the capacitor. When the generated harmonic voltages are well above the resonant frequency of the circuit, there will be some increase in harmonic current resulting from the addition of the capacitor, but the harmonic voltage at the location of the capacitor will be materially reduced. In certain situations, this reduction in harmonic voltage may result in substantial decrease in noise in paralleling telephone circuits in exposures beyond the capacitor location. This may be of particular importance in rural areas as discussed in Section 8 of Engineering Report No. 40.*

The importance of these resonance conditions from the standpoint of inductive coordination depends upon a number of characteristics of both the power and telephone circuits. Among these are the following:

Magnitudes and frequencies of the harmonic voltages impressed on the distribution circuit.

Type of distribution system—delta, or wye with unigrounded or with multigrounded neutral.

Line length between the capacitor and substation.

Size (kva) of the capacitor.

Type of capacitor installation — single phase or three-phase delta or wye.

Length of exposure and its location with respect to the capacitor.

Separation in the exposure—joint use or roadway.

Type of telephone circuit—toll or subscriber.

Type of telephone plant — open-wire or cable.

Susceptiveness of station set in the case of subscriber circuits.

It is evident from the number of factors involved that it is impracticable to cover in detail the possibilities of noise induction for the various combinations which may be encountered in practice.

The coordinative measures which are appropriate for any specific case where a noise problem is encountered from a capacitor installation will depend upon the circumstances surrounding that particular situation. The solution may involve the application of such measures, either singly or in combination, to either the power or telephone system or to both. The following is a brief discussion of some possible measures:

a. Single-Phase Capacitor Installations.

When capacitors are connected in outlying sections to single-phase extensions consisting of a phase wire and multi-grounded neutral, the likelihood of noise induction is greater than when the capacitors are connected in three-phase banks on the three-phase portion of the feeder. This is because of the possibility of longer exposures and of the presence of open-wire telephone circuits in the outlying areas. The connection of capacitors as three-phase banks, rather than individually on single-phase extensions, will usually result in lower power circuit influence.

b. Phase-to-Phase Connection of Capacitors in Three-Phase Sections.

For installations where the induction from ground-return currents would otherwise tend to predominate as, for example, in the case of distribution systems having the neutral conductor multi-grounded, the connection of the capacitors from phase wire to phase wire in the three-phase section would minimize the ground-return current. It should be appreciated that this measure would be expected to result in no appreciable reduction in the balanced components.

c. Use of Device in Neutral of Wye-Connected Banks.

The use of a low voltage gap (instead of a direct connection) between the neutral of a wye-connected capacitor bank and the multi-grounded neutral conductor would also be effective in minimizing the ground-return current (but without appreciably reducing the balanced currents). Such a gap, if properly set, will spark over should a fault occur in a capacitor unit in one phase, thus preventing sustained overvoltage (line-to-line voltage) on the remaining capacitor phases. On 4000 volt wye circuits, the gap will be so small that difficulties may be encountered in maintaining it.

d. Change in Location or Size (kva) of Capacitor.

A change in the size of the capacitor on a feeder or in the number of capacitors on a feeder would change the frequency at which resonance occurs. With a knowledge of the wave shape of the impressed voltage and of the constants of the supply system and distribution circuit, it may be possible to select a capacitor size or location which would result in decreased inductive influence.

e. Auxiliary Reactor in Series with Capacitor.

Another method involves connecting an auxiliary reactor in series with the capacitor on each phase. This reactor would have a 60-cycle impedance of the order of five per cent of the phase-to-neutral impedance of the capacitor and the combination would, in effect, appear as a resonant shunt at a frequency of about 270 cycles. On a multi-grounded system this arrangement would, theoretically, be particularly effective in minimizing the ground-return currents at frequencies of 300 cycles and above. Some increase in the 180-cycle component may occur in the case of capacitors connected from phase wires to neutral. This arrangement would probably be effective in all cases except where the noise induction was controlled by the 180-cycle ground-return currents. It should be appreciated that an auxiliary reactor of this type would increase the 60-cycle impressed voltage across the capacitor by about 5 per cent, and increase the capacitor kva by 10 per cent, but the net kva of the installation by only 5 per cent.

f. Reactor in Neutral of Wye-connected Capacitors.

A similar reactor in the neutral of a wye-connected capacitor can be used to reduce the noise induction due to residual components. This reactor would have a 60-cycle impedance of about 4 per cent of the phase-to-neutral impedance of the capacitor, the combination constituting a resonant shunt at 180 cycles in the residual circuit. It would destroy any resonant condition, in the residual circuit, between the capacitor and the line, and would reduce all harmonic residual currents.

g. Cable Sheath Shielding for Telephone Circuits.

Longitudinal voltages induced in exposed telephone cable circuits may be reduced by connecting the cable sheath to low impedance grounds. The effectiveness of this method will depend to a certain extent upon the size of the cable involved and the disturbing frequencies, being greater for the larger cable sizes or higher frequencies.

h. Coordinated Telephone Transpositions.

Coordinated transpositions in exposed open wire telephone circuits offer a means of noise reduction in those cases where the direct metallic-circuit induction is an important contributor. This measure, for example, would be most effective on toll circuits and on subscriber circuits equipped with bridged ringers or with grounded ringers of the higher impedance type. However, in cases where numerous discontinuities are present, the effectiveness of these telephone transpositions is reduced.

i. Change in Telephone Station Equipment.

The noise in the receiver of common battery party line station sets may be materially reduced by substituting sets equipped with the double condenser higher impedance ringer arrangement for those having single condensers with lower impedance ringers. For subscriber circuits in cable, the use of party line station sets equipped with double condensers and the lower impedance ringers, in conjunction with cable sheath shielding, may also give material reductions in noise.

In common with other situations involving substantial change in power or telephone plant, an extensive application of capacitors should receive a preliminary joint review and appraisal, so as to simplify and minimize any problems that might arise. In this connection it must be remembered that there is no unique or universal solution to coordination problems if the best engineering answer is to be obtained.

* EEI Publication F2, Bell System Practice AB64.400.

Electric Water Heaters

LATE in 1936 a Joint Committee of the Edison Electric Institute and the National Electrical Manufacturers Association was formed at the request of the Manufacturers Association, for the purpose of jointly studying some of the mutual problems associated with the domestic electric storage type water heater. This committee met in December and agreed that the first step in the joint study was the preparation of mutually acceptable test specifications so that the problem of testing would be simplified and comparisons made on a sound basis.

A total of nine meetings were held and a final mutually acceptable report was completed on May 5, 1938. This report has been approved by the interested committees of the Edison Electric Institute and the National Electrical Manufacturers Association. Although these standards have been agreed to by the committee certain of the tests require considerable time and expense to run. Consequently, the manufacturers may not be able to promptly supply results of tests for all items.

The Test Specification is intended to establish a uniform testing procedure to make possible the determination of the performance of electric storage water heaters in terms of safety, effectiveness, durability and convenience with respect to minimum requirements. It is intended to apply to electric storage water heaters primarily intended for general domestic use, of types in which the temperature of the water is under control of one or more automatic temperature regulating devices.

The Specification provides the minimum requirements for such items as marking, hydrostatic test, electrical insulation, and sturdiness. It also provides methods for determining the quality of the assembly, both as to its operation in service and as to its probable life under varying conditions.

Attached to the Specification are appendices giving the detailed procedure to be followed in making many of the tests.

It is the hope of the committee that the use of this test procedure will result in improvement in domestic electric water heaters and improvement in their application under various conditions. The committee believes that the use of this Specification will ultimately result in considerable reduction in the number of types and sizes of water heaters which are required, allowing for an ultimate standardization of fewer sizes and types of heaters.

The Test Specification is available to manufacturers through the general office of the National Electrical Manufacturers Association, and to the operating power companies through the general office of the Edison Electric Institute.

The EEI members of the joint committee on electric water heaters are:

R. C. Bryce, Chairman.....Philadelphia Electric Co., Philadelphia, Pa.
J. H Foote.....Commonwealth & Southern Corp., Jackson, Mich.
H. J. Klumb.....Rochester Gas & Elec. Co., Rochester, N. Y.
K. M. Robinson.....Idaho Power Company, Boise, Idaho
J. O'R. Coleman (Alternate).....Edison Electric Institute, New York City

The NEMA members of this committee are:

A. E. Julian, Chairman.....McGraw Electric Company, Chicago, Ill.
L. E. Berg.....Edison General Elec. Appliance Co., Chicago, Ill.
Percy Gray.....Thermogray Company, Jefferson, Iowa
W. J. Russell.....Westinghouse Elec. & Mfg. Co., Mansfield, Ohio

CONVENTIONS AND MEETINGS

AUGUST

29-31 Illuminating Engineering Society, Nicollet Hotel, Minneapolis, Minn.
29-31 Rocky Mountain Electrical League, Canyon Hotel and Lodge, Yellowstone Park, Wyo.

SEPTEMBER

1 Illuminating Engineering Society, Nicollet Hotel, Minneapolis, Minn.
7-9 Pennsylvania Electrical Association, Bedford Springs Hotel, Bedford Springs, Pa.
9-10 Maryland Utilities Association, George Washington Hotel, Ocean City, Md.
12-15 National Electrical Contractors Association, Book-Cadillac Hotel, Detroit, Mich.
12-15 International Municipal Signal Association, Lord Baltimore Hotel, Baltimore, Md.
15-16 Empire State Gas and Electric Association, Lake Placid Club, Lake Placid, N. Y.
19-20 Wisconsin Utilities Association, Transportation Section, Lawsonia, Green Lake, Wis.
22-24 American Trade Association Executives, William Penn Hotel, Pittsburgh, Pa.
23-24 Wisconsin Utilities Association, Accounting Section, Lawsonia, Green Lake, Wis.
29-30 Indiana Electric Association, French Lick Springs Hotel, French Lick Springs, Ind.
30 Public Utilities Association of West Virginia, The Greenbrier Hotel, White Sulphur Springs, W. Va.

OCTOBER

1 Indiana Electric Association, French Lick Springs Hotel, French Lick Springs, Ind.
1 Public Utilities Association of West Virginia, The Greenbrier Hotel, White Sulphur Springs, W. Va.
3-4 Prime Movers Committee, EEI, University of Michigan, Ann Arbor, Mich.
3-6 American Transit Association, Toronto, Canada.
3-6 American Transit Association, The Royal York Hotel, Toronto, Can.
3-7 National Restaurant Association, Chicago, Ill.
5-9 Electrical Manufacturers Club, The Homestead, Hot Springs, Va.
6-7 Accident Prevention Committee, EEI, Old Point Comfort, Va.
10-11 Electrical Equipment Committee, EEI, Chamberlain Hotel, Old Point Comfort, Va.
10-14 American Gas Association, Atlantic City, N. J.
10-14 National Safety Council, Stevens Hotel, Chicago, Ill.
11-12 Transmission and Distribution Committee, EEI, Chamberlain Hotel, Old Point Comfort, Va.
17-20 National Electrical Wholesalers Association, Drake Hotel, Chicago, Ill.
24-25 Wisconsin Utilities Association, Commercial and Technical Divisions of Electric Section, Schroeder Hotel, Milwaukee, Wis.
24-28 National Electrical Manufacturers Association, Palmer House, Chicago, Ill.